



Residential Collection of
**Household End-of-Life Electrical
and Electronic Equipment**
Pilot Collection Project





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 1

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As the Information Highway becomes more and more a part of our everyday life, it seems that computers and electronic equipment are on every office desktop, in every retail store and, more and more, in every home. The ingenuity and productivity of the computer and electronics industries produce machines that do more work than ever before, and do it faster. However, this amazing technological proliferation raises a new concern: What happens to all of this equipment when it is no longer useful?

One promising solution -- a solution EPA is taking a close look at -- is the recovery and recycling used electrical and electronic equipment. Unwanted or unneeded equipment can be used to provide a number of benefits. Functioning equipment can find new homes in schools and with community groups. Equipment that doesn't work can be taken apart or "demanufactured" so that the component materials -- glass, metal, plastic etc.-- can be recycled into new computers or other products. In fact, there is a growing industry that does just that -- providing thousands of pieces of useful equipment by recycling components of older electronic products.

Unfortunately, little information exists on what happens to computers and electronic equipment at the end of their useful life, making it difficult to establish effective measures to promote their recycling. In order to generate data about the fate of such equipment, EPA sponsored a series of residential collections of used electrical and electronic equipment that took place in 1996 and 1997 in Somerville, Massachusetts and Binghamton, New York. As a result of these collections, for the first time there is now data on the type and amount of material collected, transportation and demanufacturing costs of the material, and the percentage of recyclable materials in such equipment.

This report provides detailed information on these efforts. Additionally, it provides essential information on how communities might undertake electronics collection project -- helping communities and entrepreneurs determine the economic viability of residential electronic equipment recycling.

This project is part of the Computer and Electronics Sector of the Common Sense Initiative (CSI), EPA's flagship program for developing more flexible, innovative approaches to environmental protection. Launched by EPA Administrator Carol Browner in 1994, the Common Sense Initiative involves bringing together representatives from federal, state, and local governments, environmental advocate organizations, labor, and industry together to create cleaner, cheaper, and smarter ways to protect public health and the environment.

I am pleased to present this report to you and encourage you to use the information included within to help make America a safer, healthier, more beautiful place.

A handwritten signature in black ink, appearing to read "John P. DeVillars", is written over a faint, circular official stamp.

John P. DeVillars
Regional Administrator
EPA's New England Office

TABLE OF CONTENTS

	Page
Acknowledgments	1
Executive summary	2
1.0 INTRODUCTION	9
1.1 Background	
1.2 Goals of the Pilot Project	
1.3 Project Team	
2.0 PILOT COLLECTION AND PLANNING	11
2.1 Community Selection and Profile	
2.2 Regulatory Issues	
2.3 Equipment Specifications and Data Collection	
2.4 Fee for Collection Services	
2.5 Outreach	
2.6 Onsite Logistics	
3.0 COLLECTION EVENTS	27
3.1 Commodities Collected	
3.2 Somerville - November 2, 1996	
3.3 Binghamton - November 9, 1996	
3.4 Somerville - April 19, 1997	
3.5 Binghamton - May 10, 1997	
3.6 Summary of Participation	
4.0 DEMANUFACTURING/REUSE/DISPOSAL OF MATERIAL COLLECTED	37
4.1 Transportation	
4.2 Demanufacturing	
4.3 Reuse	
4.4 Final Disposition	
5.0 ECONOMIC EVALUATION OF THE PILOT COLLECTIONS	44
5.1 Costs and Revenues Included in Economic Analysis	
5.2 Unit Market Value of Recovered Materials	
5.3 Transportation Costs	
5.4 Labor Costs	
5.5 Somerville Economic Evaluation	
5.6 Binghamton Economic Evaluation	
5.7 Summary	
6.0 CONCLUSIONS AND RECOMMENDATIONS	51
6.1 General Conclusions	
6.2 Improving the Economics	
6.3 Recommendations	

APPENDICES

- Appendix 1 CSI Involvement and Development
- Appendix 2 CSI Detailed Workplan for Pilot Projected
- Appendix 3 Information on Binghamton and Somerville Recycling
- Appendix 4 Generator Survey
- Appendix 5 Manifest
- Appendix 6 Flier (sample)
- Appendix 7 Sample Press Releases, etc.
- Appendix 8 Training Packet
- Appendix 9 Organizing a Household Electrical and Electronic Equipments Collection

TABLES

- Table 2.1 Demographic Profile of Binghamton NY
- Table 2.2 Demographic Profile of Somerville MA
- Table 2.3 Somerville MA Equipment, Staffing and Supply Needs
- Table 2.4 Binghamton NY Equipment, Staffing and Supply Needs

- Table 3.1 Summary of all Equipment collected
- Table 3.2 Somerville Fall 1996 Collection Summary
- Table 3.3 Binghamton Fall 1996 Collection Summary
- Table 3.4 Somerville Spring 1997 Collection Summary
- Table 3.5 Binghamton Spring 1997 Collection Summary
- Table 3.6 Weight Comparison
- Table 3.7 Number of Participants
- Table 3.8 Number of Items Collected
- Table 3.9 Origin of Participant
- Table 3.10 Effective Communication
- Table 3.11 Households vs. Vehicles
- Table 3.12 Participating Households vs. Community Households

- Table 4.1 Summary of Weights of Separated Post-consumer Electronics
- Table 4.2 Somerville Fall 1996 Materials and Weights Collection Data
- Table 4.3 Somerville Spring 1997 Materials and Weights Collection Data
- Table 4.4 Binghamton Fall 1996 Materials and Weights Collection Data
- Table 4.5 Binghamton Spring 1997 Materials and Weights Collection Data

Table 5.1	Average Market Value
Table 5.2	Demanufacturing Labor Analysis
Table 5.3	Somerville Fall 1996 Values and Costs
Table 5.4	Binghamton Fall 1996 Values and Costs
Table 5.5	Somerville Spring 1997 Values and Costs
Table 5.6	Binghamton Spring 1997 Values and Costs
Table 5.7	Summary Values Including Resale
Table 5.8	Summary Values Without Resale

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This report was drafted by the NRRA, and was written by Peg Boyles and Spencer Bennett. Additional NRRA staff includes: Paula Dow, Russell Allen, Kim Morrell, and Pat Dervin-Fox.

This project was managed by Christine Beling, U.S. Environmental Protection Agency (EPA -New England) and directed by a workgroup formed under EPA's Common Sense Initiative which included: Mark Mahoney, EPA-New England, Christine Bonica, EPA-New England; Greg Voorhees, Envirocycle, Inc.; Patricia Dillon, Tufts University-The Gordon Institute; Hilary Eustace- Recycling Coordinator, Somerville, MA; Susan Thompson, Recycling Coordinator, Broome County; Richard King, Matsushita Consumer Electronics Company; Ron Stow, Lucent Technologies.

The report was peer reviewed by several members of the workgroup and David Isaacs, Electronic Industries Association; Michael Winka, N.J. Department of Environmental Protection; Mark Sharp, Matsushita Electric Corporation of America; Tony Hainault, Minnesota Office of Environmental Assistance; Doug Wolf, New Mexico Environmental Law Center, and George Garland, EPA-Office of Solid Waste.

For more information or details on this pilot project, please contact NRRA, PO BOX 721, Concord, NH 03302-0721, 603-224-6996, e-mail: "nrna@conknet.com" or for a copy of the report EPA New England's Research Library for RCRA, JFK Federal Building, Mail Code SPP, Boston, MA 02203, 617-565-3282 , e-mail: "friedman.fred@epamail.epa.gov".

EXECUTIVE SUMMARY

A. GOAL

The Common Sense Initiative-Computers and Electronics Sector sponsored a series of collection days to recover residential end-of-life (EOL) electrical and electronic equipment for demanufacturing and recycling. The goals of the pilot project were:

- to characterize the types and measure the volumes of end-of-life electrical and electronic equipment in the municipal waste stream
- to assess the economic viability of collecting, transporting, demanufacturing and recycling end-of-life (EOL) residential electrical and electronic equipment
- to gauge residential consumers willingness to help offset the costs of collecting and recycling electrical and electronic equipment

B. APPROACH

The collection pilots were held in two demographically similar communities: Somerville, Massachusetts and Binghamton, New York based on population, per capita income, state and local tax burden and weekly curbside pick-up of trash and recyclables. A total of four collection days were held, two events in the Fall of 1996 in both Somerville and Binghamton and two events in the Spring of 1997 in both communities.

The collection pilots were modeled after the traditional one-day collection events for household hazardous waste collection; typically, a one time collection event held on Saturday morning and early afternoon. Outreach for the events included direct mail flyers to every household, press release to local papers, signage at local retail establishments and advertising on local cable access channel calendars. A brief generator survey and receiving manifest were developed to record information from the collection events. Every participant was interviewed by a volunteer who recorded on a manifest what materials were dropped off. A survey was then given to a representative from each vehicle to assess their motivation for participating in the event, how they heard about the collection event, where they lived (in a single or multiple family home), the usage of the equipment (personal or business), the age and condition of the equipment, and the willingness to pay for this type of disposal.

Envirocycle, Incorporated, is an electronics demanufacturer who provided in kind services for the transportation, demanufacturing, recycling and disposal of all EOL equipment collected in the pilots. All EOL equipment that was collected was

transported to Envirocycle's Hallstead, Pennsylvania facility. Envirocycle provided cost and revenue information for the transportation, demanufacture, marketing and disposal of all materials generated from the collection pilots.

C. PARTICIPATION RESULTS

Less than 1% of the residents in the host communities participated in the collection event. Generally, participation increased at both sites during the second event as was expected from past history of the communities other special collection events (i.e. household hazardous waste, tire and text book collection events). This increase of participation was also consistent with Somerville and Binghamton's experience with introducing new commodities as part of increasing recyclables collection.

Number of Households Participating vs. Number of Vehicles

	Households	% Participation by Household	Total # of Households
Somerville Fall 1996	193	0.62	31,000
Somerville Spring 1997	250	0.80	
Binghamton Fall 1996	47	0.02	25,000
Binghamton Spring 1997	128	0.05	

D. CHARACTERIZATION RESULTS

A total of 1,862 items of EOL was collected in the four collection events. The majority of the items collected consisted of TVs, computers and monitors, and portable audio equipment. These results were compiled from manifests that were completed by volunteers during the actual collection event.

	FALL 1996		Spring 1997		Total
	Somerville	Binghamton	Somerville	Binghamton	
HOME VIDEO					
Table Top TV	49	23	59	42	173
Floor Model TV	5	0	2	10	17
VCR	27	4	46	23	100
AUDIO					
Port. Radio/Tape/CD	58	1	36	82	177
Home Stereo	23	26	26	12	87
Tape Recorder	18	0	10	7	35
Car Audio/Tape	12	0	7	4	23
Speakers	23	3	17	6	49
Electronic Instruments	1	1	6	6	14
OFFICE					
PC/Computer	21	7	72	19	119
Monitor	17	8	52	33	110
Keyboard	18	7	44	26	95
Printer	12	2	40	9	63
Copier	0	0	1	0	1
Fax	0	0	1	1	2
COMMUNICATION					
Resident Phone	8	4	33	22	67
Business Phone	4	0	4	7	15
Cellular Phone	0	0	1	1	2
Cordless Phone	0	0	2	10	12
2-Way Radio	2	0	1	1	4
Answering Machine	4	4	31	8	47
HOME APPLIANCE					
Microwave Oven	12	3	12	12	39
Air Conditioner	8	0	19	8	35
Vacuum	17	2	7	18	54
SMALL COUNTER TOP APPLIANCE					
Toaster Oven	23	12	29	33	97
Can Opener	4	0	4	6	14
Coffee Maker	11	3	20	9	43
Food Processor	3	0	4	2	9
MISCELLANEOUS	10	35	213	101	
TOTAL	390	145	809	518	1862

A total of 32,574 pounds of EOL equipment was collected in the four collection events.

Weight of Materials Collected

LOCATION	FALL 96	SPRING 97	% Increase
Somerville	7,448 lbs.	13,723 lbs.	84%
Binghamton	2,372 lbs.	9,031 lbs.	281%

The largest category (by weight) of items collected was TVs, air conditioners and

computer equipment. The EOL equipment collected was further divided into the following categories for shipment to the demanufacturing facility.

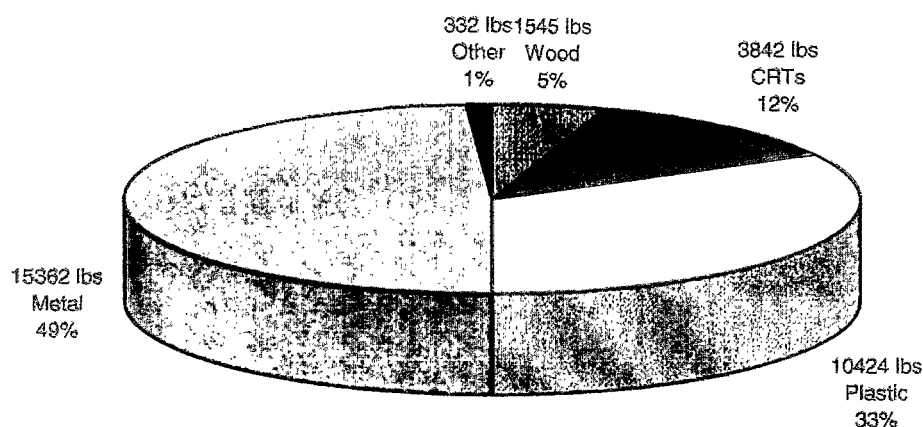
Collections by Weight in Pounds

CATEGORY	Somerville, MA		Binghamton, NY		TOTAL
	Fall 96	Spring 97	Fall 96	Spring 97	
Large TVs/ACs	1,665	3,508	893	2,932	8,998
Office Equipment	266	619	102	0	987
Large Electronics	1,196	762	205	878	3,041
Computer Equipment	852	3,529	339	1,487	6,207
Monitors/Small TVs	631	1,158	226	1,177	3,192
Small Electronics	738	584	134	761	2,217
Kitchen appliances	694	362	162	1,090	2,308
Miscellaneous	1,406	2,132	311	706	4,555
SUBTOTAL	7,448	12,654	2,372	9,031	31,505
Resale/Computer Equipment		1,069			
TOTAL	7,448	13,723	2,372	9,031	32,574

E. DEMANUFACTURING CHARACTERIZATION

The equipment collected was demanufactured and the following is a breakdown of the material fractions of the equipment. Metals (49%) and plastic (33%) combined account for over 82% of the collected materials. All materials were recycled and marketed with the exception of the wood which was disposed of in a municipal solid waste landfill.

Summary Of Raw Materials Demanufactured

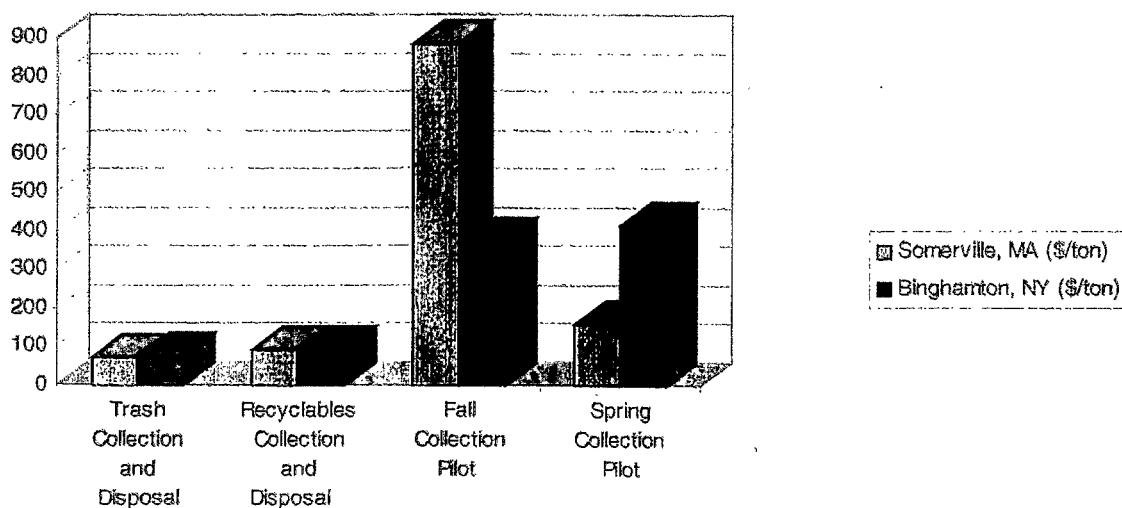


Total = 31,505 lbs

Note that a total of 1,069 pounds of computer equipment collected from the Spring 97 Somerville collection was not demanufactured but resold in the same condition it was collected.

F. CONCLUSIONS

This residential collection pilot project removed more than sixteen tons of material from municipal solid waste disposal, including some toxic constituents such as lead from CRT glass; and cadmium, and other potentially toxic substances as pigments, stabilizers or fire retardants in engineering plastics. The collections also captured alkaline and nickel-cadmium batteries.



The economic analysis from this pilot program to recover household electrical and electronic equipments from the municipal/small business waste stream ranged from \$159/ton to \$886/ton and thus exceeded the costs of handling those wastes as trash at \$75/ton or traditional recyclables at \$90/ton.

However, it is important to note that the costs provided in this report are based on pilot collection rates in a given area at a given time under specific marketing conditions. Historically, diverting any commodity from the municipal waste stream has not become economical until a recovery, reuse/recycle infrastructure has developed and matured for that commodity or group of commodities.

The general response from the residents was positive and consequently, both Binghamton and Somerville are including an end-of-life electrical and electronics collection in their 1998 solid waste program. Based on the lessons learned here, each community plans on modifying the collection model and strategy to collect, transport and demanufacture this material more efficiently. In addition, Envirocycle will be marketing this type of service to municipalities and is willing to work directly with municipalities to design and develop collection programs specific to a communities needs.

G. IMPROVING THE ECONOMICS

This pilot project was designed utilizing the one day collection event model typical for the collection of household hazardous waste. This pilot demonstrated that many variables impact the overall economics of the EOL electrical and electronic equipment collection. Based on the results of the pilot, and the traditional solid waste hierarchy of reduce, reuse, recycle, incinerate and finally landfill, several recommendations begin to emerge for improving the economics of end-of-life electrical and electronic collection and recovery programs including:

- **Efficient sorting of EOL electrical and electronic equipment** Based on the specific objectives of the collection event, segregate equipment for toxicity, existing recycling infrastructure (i.e. scrap metal), and value for demanufacturing or traditional disposal as municipal solid waste.
- **Evaluate partnering opportunities** There are existing organizations that can be accessed for charitable donation, and reuse or job training opportunities for working EOL electrical and electronic equipment.
- **Minimize transportation** Costs associated with transportation argue for minimizing distances from the collection site to the demanufacturing facility.
- **Maximize load** Costs associated with transportation argue that the maximum

safe load be trucked from the collection site to the demanufacturing facility.

- **Optimize the location and accessibility of the collection site** To encourage participation utilize an existing and known site(s) for collection activities within a community.
- **Minimize Collection Labor Costs** Utilize volunteer labor from existing municipal or recycling committees for the collection event.
- **Increase community participation** Organize outreach activities to maximize participation and to potentially tag onto other traditional community collection events, i.e. text book collections, household hazardous waste collections, tire collections.
- **Evaluate the communities willingness to pay** Based on accepted community practices and expectations, determine if a fee for the collection service is appropriate.

H. GENERAL RECOMMENDATIONS

The pilots conducted as part of this project followed on the traditional one day collection household hazardous waste model utilizing a electronics demanufacturer for reuse/resale, recycling and disposal. The results argue for improvements to the model to enhance the economic viability of conducting end-of-life electrical and electronic collections in municipalities. Every community is unique and should design a program that is applicable to its specific needs.

Given the small quantity captured in this pilot program, it is hypothesized that an on-going electrical and electronic equipment recycling program may have greater participation, and may yield a final cost equivalent to the current solid waste handling and disposal cost for a community. The economics may also be enhanced as the older electrical and electronic equipment is passed through the system and newer, more valuable electronic items may be recovered.

Note that there are other collection models that may be applied to end-of-life electrical and electronic equipment that were not specifically evaluated as part of this pilot. One collection method is partnering with local commercial business entities to organize a municipal collection event. A second collection method is partnering with existing not-for-profits to collect usable end-of-life electrical and electronic equipment. Finally, there are infinite collection, reuse, demanufacturing and recycling scenarios that may be applicable to a specific municipality. This report makes not attempt at evaluating every type of potential scenario. The CSI work group is sponsoring additional research into collection methodologies and will publish its findings in the Summer of 1998.

1.0 INTRODUCTION

1.1 BACKGROUND

This project evolved from the Common Sense Initiative (CSI), an innovative U.S. Environmental Protection Agency (EPA) approach to environmental protection and pollution prevention. Launched in January 1995 under the stewardship of EPA Administrator Carol Browner, CSI addresses environmental management by industrial sector rather than by environmental medium (e.g., air, water, land).

CSI's 25-member Computer and Electronics Subcommittee includes senior management staff from the electronics industry, state government and non-governmental organizations (Appendix 1). The Subcommittee established several goals, one of which was to eliminate regulatory barriers and provide incentives for recycling, pollution prevention and innovative technology. An internal working group, "Overcoming Barriers to Recycling and Pollution Prevention," was established to address these issues.

This working group began looking at the infrastructure for reusing and/or recycling end of life electrical and electronic equipment (EOL) discarded as part of the nation's solid waste stream. The group found insufficient information and data gaps on the risks, technical feasibility and costs associated with collecting and recycling residential electrical and electronic equipment. Most available information focused on efforts to collect, dismantle and recycle end-of-life electrical and electronic equipment from the commercial/industrial waste stream.

To begin filling these data gaps, the workgroup decided to sponsor research into the collection and recycling of EOL residential electrical and electronic equipment. The pilot project involved many people representing a broad range of organizations and governmental entities. They met via monthly conference calls for more than a year, designing the broad outlines of the pilot program and recruiting the necessary participants.

1.2 GOALS OF THE PILOT PROJECT

The CSI sponsored a series of collection days to recover residential electrical and electronic equipment from the waste stream (Appendix 2). The collection pilots were modeled after traditional one-day household hazardous waste collection days. A total of four collection events were held in two communities, one collection event in the spring and fall for each community.

Residents were asked to bring any electrical and electronic equipment to the collection event, including but not limited to computer equipment, televisions,

kitchen equipment, air conditioners, motorized toys, audio equipment and similar items under the general rule that "if you plug it in, we want it". However, white goods (washers, refrigerators, etc..) were specifically prohibited. Following collection, equipment was sent to an electronics demanufacturer for evaluation of resale value and demanufacturing into component materials.

The goals of the pilot project were as follows:

- to characterize the types and measure the volumes of end-of-life electrical and electronic equipment in the municipal waste stream
- to assess the economic viability of collecting, transporting, demanufacturing and recycling EOL residential electrical and electronic equipment
- to gauge residential consumers' willingness to help offset the costs of collecting and recycling electrical and electronic equipment

1.3 THE PROJECT TEAM

EPA New England served as overall project manager for the CSI subcommittee. Members of the CSI subcommittee's "Overcoming Barriers to Recycling and Pollution Prevention Workgroup" including representatives from the electronics industry, the demanufacturing industry, academia, state and local governments, formed a smaller pilot collection workgroup (hereafter the workgroup) to provide direction and oversight of the project. The workgroup designed and shaped the pilot project, developed a plan for public education and outreach, selected the participating communities, established guidelines to ensure consistency between the two pilot communities' collection efforts and oversaw the collection efforts and peer reviewed this report.

Envirocycle, Incorporated, a Hallstead, Pennsylvania electronics demanufacturing company with many years' experience dismantling and recycling electronic equipment (including household electrical and electronic equipment) received from original equipment manufacturers (OEM), offered to provide in-kind services to the pilot project. These services included free transportation of the collected electrical and electronic equipment from the collection sites to Envirocycle's plant, and demanufacturing the collected equipment for reuse or recycling in appropriate secondary materials markets. Envirocycle provided cost information for the transportation, demanufacture, recyclables marketing and disposal of all end-of-life electrical and electronic equipment collected by the pilots.

The Northeast Resource Recovery Association (NRRA) was given a cooperative agreement from EPA New England to advise the workgroup on issues involving

materials collection and transportation, municipal operator education and general public education. NRRA is a regional nonprofit organization known nationally for having pioneered the concept of marketing municipal recyclables cooperatively. The NRRA coordinated the logistics (on-ground organization and education), collected and analyzed the data, and prepared the draft report for the pilot collection project.

The Recycling Coordinator, Department of Public Works in Somerville, Massachusetts and the Public Outreach Coordinator, Broome County-Division of Solid Waste Management in Binghamton, New York actively participated in the planning process for the collection days and provided on-site coordination for the collection events. In addition, officials of the Massachusetts Department of Environmental Protection and New York Department of Environmental Conservation Divisions of Solid Waste were also informed of the pilot project.

2.0 PILOT COLLECTION PLANNING

2.1 COMMUNITY SELECTION AND PROFILE

Two communities with similar demographics were selected to host household electrical and electronic equipment collections in a study controlled to produce comparable results.

2.1.1 Binghamton NY

Binghamton, New York was selected as the first of the two pilot communities because of its proximity to Envirocycle's Hallstead plant and because Envirocycle had already established a working relationship with the City's recycling program. Broome County public works officials also were willing to sign on with the pilot project. The pilot data is specific to Binghamton's participation. However, the collection event was open to all residents of Broome County.

Historically, Binghamton has been a blue-collar city, recently redeveloped for white collar occupations, but which also maintains a slowly growing manufacturing base.

TABLE 2.1 Demographic Profile of Binghamton NY

Population in 1990	53,008
Number of Households	25,000
Per capita income	\$12,106
Median family income	\$29,169
State and local taxes	\$3,411
Trends: population loss in last five years	5%
1990 forecast of growth over next five years	5% increase

The Broome County Division of Solid Waste Management assumes jurisdiction over all solid waste activities (Appendix 3) in a county that includes 24 municipalities with a total population of 212,000. Binghamton is the County's urban "hub"; two communities, Johnson City and Endicott, have populations of about 30,000. The County's trash, recyclables and household hazardous waste (HHW) are aggregated at the Nanticoke Landfill and Materials Recovery Facility, the County's only landfill. The City of Binghamton operates a pay per bag system with curb side pick up of trash and recyclables. Residents can drop off their own household hazardous waste, tires, batteries, and used motor fluids at the Broome County Hazardous Waste Collection Facility three times each month.

Recycling is mandated by the State of New York, as well as, by Broome County local law. The recycling rate in 1995 for Binghamton was 48 percent. This percentage includes commingled household paper and commingled containers, mixed household paper collected at curb, yard waste and scrap metal. Municipal solid waste tipped at Broome County's Nanticoke Landfill in 1996 was \$40 per ton and transportation is approximated at \$35/ton for a total of \$75.00/ton. Recyclables are collected curbside at \$90/ton and processed at the Broome County managed Materials Recovery Facility at no cost or revenue for a total of \$90/ton. The City devotes 15.7 percent of finances to pay for sewerage and sanitation.

2.1.2 Somerville MA

To help in their search for a second host community, pilot workgroup asked EPA-New England to locate other cities whose demographic profile closely matched Binghamton's. After evaluating four communities EPA presented as potential choices, the workgroup selected Somerville, Massachusetts. Somerville's population, income and other demographic factors closely match Binghamton's (see chart below); also, the group felt that Somerville's New England location would simplify the logistical planning.

A suburb of Boston, Somerville historically has been a blue-and-white collar city that lost most of its manufacturing base; only 20 percent of residents work in the city.

TABLE 2.2 Demographic Profile of Somerville MA

Population in 1990	72,280
Number of Households	30,000
Per capita income	\$10,759
Average family income	\$44,866
State and local taxes	\$4,021
Trends: percent of population lost in last five years	6.5%
1990 forecast of growth over next five years	5.5 % increase

The Somerville Department of Public Works (DPW) assumes jurisdiction over all solid waste activities the city (Appendix 3). The city offers curbside pick up of trash and recyclables. The City's trash is collected and aggregated at Somerville Transfer Station operated by Waste Management. Recyclables are collected and aggregated by Prinns Recycling. Residents can drop off their own household hazardous waste at the DPW yard on Franey Road once per month each month from April to October.

Recycling is voluntary in the City and the diversion rate for traditional curbside recycles such as newspapers, bottles, and cans was 15% in 1995, and remains about the same to date. There is diversion of other materials from the solid waste stream that is not quantified. These items include: yard and food wastes composted through the backyard composter distribution program, scrap metal, automobile tires, and used engine oil through special programs for these items, and a broad range of household hazardous wastes diverted through Somerville's permanent HHW center.

Businesses may use City services for sanitation or recycling through a decal system. This constitutes less than 10% of the MSW, and less than 1% of the recycling tonnage. There is recycling through private haulers at both commercial entities and multi-unit dwellings, but this is not quantified by the City. Sewer sludge is handled by the Massachusetts Water Resources Authority (MWRA), and is not included in diversion rate figures.

Somerville tips solid waste at the Somerville Transfer Station for a cost of \$45.85/ton and transportation is \$27.00/ton for a total of \$ 72.85/ton. The cost of collection of curbside recyclables is \$67.00/ton and a tip fee of \$22.50/ton for a total cost of \$89.50/ton. Note that because the transfer station is located within Somerville's borders, the City receives a preferential tipping fee. This City devotes approximately 3.7% of its finances to sewerage and sanitation.

2.2 REGULATORY ISSUES

The collection of EOL equipment should be undertaken reviewing all applicable federal, state and local laws and regulations. Federal, state and local governments all may share regulatory authority over management of EOL electrical and electronic equipment under the Resource Conservation and Recovery Act (RCRA). Management of RCRA governs both solid waste and hazardous waste. Solid waste management is generally under state and local authority. Most RCRA requirements are implemented through RCRA-authorized state laws, which may be more (but never less) stringent than federal regulations. Both Massachusetts and New York are RCRA authorized states.

Some of the equipment collected could contain potentially hazardous materials i.e. Cathode Ray Tubes from TVs or computer monitors, printed wire boards from computers, batteries from various equipment, polychlorinated biphenyls (PCBs) capacitors from some older electronic equipment, chloroflourocarbons (CFCs) in air

conditioners. The Binghamton and Somerville Collection Pilots targeted post-consumer electrical and electronic equipment only from households and small businesses. These materials were classified as non-hazardous "household" waste and conditionally exempt small quantity generator (CESQG) waste. Under federal regulations, household waste is excluded from hazardous waste regulation in 40 CFR Section 261.4 (b) (1) and may be managed as solid waste under the State solid waste management program. This exclusion applies to any household wastes that are collected, transported, stored, treated, disposed, recovered or reused. Under the federal RCRA regulations, waste generated by Conditionally Exempt Small Quantity Generators is exempt from as long as certain restrictions are met as specified in 40 CFR 261.5.

Both Somerville and Binghamton do operate hazardous waste collection facilities, licensed to receive hazardous wastes from both households and CESQGs. These facilities were designed to store "typical" household hazardous wastes, such as paints, cleaners and solvents. The Somerville facility was located contiguous to the pilot collection site. The Binghamton pilot collection site was a satellite site not contiguous to their hazardous waste collection facility.

New York State law allows conditionally-exempt small quantity generators (such as small business, farms and institutions) who generate less than up to 220 lbs. per month of household hazardous waste to do so without a permit. Because of this exemption, Broome County as municipal entity can collect these exempt and household wastes at their permanent collection site and then transfer their generator status to a licensed hauler. Because, the pilot was conducted at a satellite collection point, the project coordinator applied for a one-day permit from the Department of Environmental Conservation, and arranged to have two 5-gallon buckets and vermiculite fill on hand for temporary storage of any HHW inadvertently received during the collection. The goal being not to return any household hazardous waste to residents participating in the pilot. This Satellite collection area was used to store a small number of items including, thermometers, PCB ballasts and batteries.

Massachusetts law required no special permits. However, the onsite household hazardous waste storage facility was utilized for various items also inadvertently brought to the collection pilot including, batteries, paints and used oil.

2.3 EQUIPMENT SPECIFICATIONS AND DATA COLLECTION

The workgroup spent a lot of time discussing collection specifications for the pilot program. Members of the group all knew that limiting the collections to computers, computer peripherals and monitors would likely result in much higher value materials. However, the objective was to "cast the net broadly" to allow a wide range of devices powered by either a battery or a electrical plug to meet the goal of determining what types of consumer EOL electrical and electronic equipment is being discarded in the municipal waste stream.

The collection did not in any way limit types of end-of-life electrical and electronic equipment and accepted any type of electronic, electrical or similar device that operates on batteries or has a plug including the following:

Televisions	Air conditions	Microwaves	Toasters
Stereo systems	Speakers	Hair dryers	Powered toys
Office equipment	Electric heaters	Lamps	Power tools
CD players	VCRs	Calculators	Vacuum cleaners
Computers	Printers	Cables and wires	Computer monitors
Telephones	Fax machines	Coffee makers	Clocks

The group also decided to invite the participation of businesses with up to 25 employees. Lacking the markets and economies of scale available to large business operations, small businesses typically do not recycle electrical and electronic equipment; much of this material is entering municipal landfills.

The traditional solid waste management hierarchy is to reduce, reuse, recycle, incinerate and landfill. In keeping with this hierarchy that favors reuse over recycling, some workgroup members argued forcefully in favor of separating for reuse those collected items that were still working or refurbishable. While the group agreed that normal municipal electrical and electronic equipments collections should separate reusable items, in the interests of obtaining comparable data on demanufacturing from the four collections, all materials collected during this pilot project would be shipped to the demanufacuter for evaluation.

The group developed a Generator Survey for participants at each collection event to fill out while waiting for staff to unload items from their vehicles. (Appendix 4) The survey was designed to develop an understanding of why people participated, how they learned about the event, whether they represented a household or a business, whether they would be willing to pay a fee to help support electrical and electronic equipment recycling and what household electronics were currently in use or in storage at the home or business.

To quickly tally and categorize the electrical and electronic equipment items as they were received during the collection events, the group developed a receiving manifest (Appendix 5) to be filled out by volunteer staff.

2.4 FEE FOR COLLECTION SERVICES

One of the original goals of the pilot project was to determine residents' and small businesses' willingness to help support the cost of recycling electrical and electronic equipment. The fall collection event in Binghamton did include a \$2 fee per

participating vehicle. The money collected went to support Broome County's recycling education and outreach programs. The fee was dropped in the Spring collection.

There was no fee collected in either of the Somerville collections. While there is no local ordinance that precludes Somerville from charging a fee for participating in special collection events, the City has determined that fees generally deter voluntary program participation. In general, Somerville residents view a fee as additional taxation, therefore as a matter of public policy, Somerville will not charge for any solid waste or household hazardous waste collections.

The generator survey utilized in the Spring collections also specifically questioned the participants, "To help offset costs of collection and recycling, would you be willing to pay to drop off your electronics?" The survey gave the following choices, (1) \$1-5, (2) \$5-10 or (3) greater than \$10.

2.5 OUTREACH

To inform residents and small business owners about the consumer electrical and electronic equipment collection days, the pilot workgroup decided on five outreach strategies to be used in both participating communities.

1. Flyers The group decided to mail an informational flyer (Appendix 5) to each household in Somerville and Binghamton and to make flyers available at retail electronics stores and public buildings. The flyer was a simple three-panel flyer introducing the pilot project, explaining what items to bring and giving directions to the collection site. Each flyer also included a brief message from an appropriate public official (Somerville's mayor, Broome County's County executive).

Since participation in the collection days was limited to households and businesses with fewer than 25 employees, the flyers provided Envirocycle's toll-free number to call for information about recycling larger quantities of electrical and electronic equipment.

The pilot workgroup initially planned to translate the direct-mail flyers in several different languages to reflect the ethnic diversity of the host communities. The high cost of producing and distributing several different versions of the flyer forced the workgroup to abandon this strategy. Even deciding which languages to include in the multi-lingual versions would have been difficult, since both Somerville and Binghamton contain many non-English speaking minority groups, with no single group comprising a significant percentage of the overall population.

NRRA staff developed the flyer with in-house desktop publishing software, delivering the document to a Docutech printer on disk. The flyers were mailed about two and a half weeks before each collection day to all households in the

community. An additional 3,000 flyers were printed for distribution at public buildings and retail outlets selling household electrical and electronic equipment.

2. Chambers of Commerce and Members Notification The group discussed notifying local chambers of commerce and opted not to outreach directly to this entire group, but selectively notified businesses that repaired electrical and electronic equipment that were members of the Chamber. In general, outreach can be accomplished via direct contact, visitation at meeting, a presentation and written communication.

3. Public service announcements/community calendar listings on local radio, cable and network TV stations The group discussed using public service announcements and decided that there was too much disparity between the two communities to utilize this advertising mechanism. However, each community calendar did publicize the events.

4. Press releases Because most government jurisdictions have established procedures for handling press releases (Appendix 6), as well as mailing lists for local media, the workgroup assigned responsibility for developing and distributing press releases to Somerville and Broome County project coordinators.

5. Press conference involving local officials A press conference was organized in both Binghamton and Somerville.

2.5.1 Somerville

Because Somerville is a suburb of the much-larger city of Boston, news important to Somerville residents has difficulty penetrating the Boston newspapers, TV and radio stations. Historically, direct-mail flyers have worked well to inform Somerville residents of special solid waste, household hazardous waste or recycling collections.

EPA, in conjunction with the Somerville city public relations department developed a press release sent to major local and Boston news media (Appendix 7). In mid-October, the Somerville Mayor, the EPA-New England regional administrator and NRRA's executive director held a joint press conference at the Somerville site on Wednesday, October 16. The *Somerville Journal* attended and printed a story on the collection event. In addition, the local cable station ran announcements of the collection on its daily calendar of events section.

The Somerville recycling coordinator and the EPA project manager appeared together October 17 on the weekly cable TV show, *The Mayor's Report*, hosted by the editor of the *Somerville Journal* and the mayor, spending a full 20 minutes discussing the collection pilot.

In early October, from a mailing list supplied by the Chamber of Commerce, a letter containing information about the collection was mailed to each of the dozen businesses selling consumer electrical and electronic products in Somerville, along with two signs to post in the stores announcing the event and two dozen flyers for distribution to customers.

Two weeks before the November 2 collection, flyers were mailed to 32,124 Somerville households. Flyers were also distributed at the public works facility and set out in public buildings.

2.5.2 Binghamton

As the "urban" hub of Broome County, Binghamton is home to three network TV affiliate stations, six FM radio stations and their AM. The county administrator holds frequent, well-attended news conferences to bring forward issues of public importance. Broome county mailed a press release on the event in early October to local residents.

A news conference was held at the County office building. Three radio stations, two TV stations, and the local newspaper attended the conference. Envirocycle also held a facility tour attended by one TV station and approximately six members of Broome County Business & Industry Committee (called Broome County Waste Coalition). Several of these people also served as volunteers at the collections. Another newspaper had previously featured Envirocycle in a business article, so they did not participate in the tour.

2.6 ONSITE LOGISTICS

A total of four collection events were planned to be held on Saturdays in the two host communities: a fall and spring collection event in both Somerville, Massachusetts and Binghamton, New York.

2.6.1 Logistics Overview

NRRA staff met with public works department employees of both Somerville and Broome County and with Envirocycle to develop a detailed logistical plan for each community. Logistics planning for both sites involved:

- selecting the dates and hours for collections
- choosing a site for the collection that would be central and accessible
- designating zones within each site for unloading vehicles, storing the equipment received, loading Envirocycle's trucks and handling paperwork, as well as break areas for workers
- planning traffic flow patterns to prevent bottlenecks and possible dangers to workers, volunteers and participants
- estimating participation rate and volume of materials to be collected

- developing a plan for paid and volunteer staff to welcome incoming participants and direct them to the unloading site, unloading the vehicles, sorting the equipment into categories and loading the materials into Envirocycle's box trailer
- protecting incoming materials from the weather
- selecting the mix of supplies and equipment for storage, loading and transportation of the equipment
- managing interactions with other operations going on simultaneously at the site
- training collection day volunteers and paid employees
- ensuring the safety of employees and volunteers
- providing refreshments for workers
- developing and printing participant surveys and shipping manifests

Dates The project group selected Saturday for the one-day collections. Throughout most of the Northeast, Saturday is the traditional "dump day", when residents take their trash and recyclables to the municipal solid waste facility or prepare them for pick-up. People are on the move; stores and public libraries are open. Volunteers who work full-time jobs during the week become available to staff the collection events.

Although the group had planned to hold the first collection in late summer or early fall (to coincide with back-to-school/fall housecleaning), funding delays pushed the collection dates forward into early November of 1996, with the second collections held in mid-April (Somerville) and early May (Binghamton).

Municipal coordinators aimed for Saturdays that would not conflict with major community events (e.g., graduations, city-wide festivals). The project workgroup deemed the winter months inappropriate; major debilitating snow and ice storms are common throughout the Northeast between early December and early March.

The workgroup also decided to hold the two collection events six months apart rather than on consecutive days or weekends. This would enable local project coordinators to respond to callers who missed the first collection date by urging them to mark the second date on their spring calendars.

Storage and Handling Envirocycle provided a 48' box trailer and a straight-body truck, gaylord boxes for storing the small equipment, pallets and shrink wrap for securing and moving the larger equipment. Kitchen appliances and small electronic devices were sorted into gaylord boxes; the other categories of large equipment were kept separate, then loaded onto pallets and shrink-wrapped for shipment (TVS, air conditioners, etc.).

Pallet jacks and a forklift handled the heavy lifting, with pallet jacks hoisting and moving gaylords and pallets around on the ground and the forklift being used for

loading Envirocycle's trailer and truck. In case of rain, workers could use the straight truck for dry storage.

Training All workers came an hour before the start of each collection day for a brief training session. Training packets were handed out to workers arriving for training (Appendix 7).

Onsite Paperwork A brief generator survey and receiving manifest were utilized to record information from the collection events (Appendix 4 and 5). As each vehicle pulled into the unloading zone, a volunteer at the unloading area recorded each item received onto a receiving manifest form—one manifest form per vehicle—while other volunteer unloaded the equipment. Every participant was interviewed by a volunteer who recorded on a manifest what materials were dropped off. A survey was then given to a representative from each vehicle to access their motivation for participating in the event, how they heard about the collection event, where they lived (in a single or multiple family home), if this was personal or business equipment, the age and condition of the equipment, and their willingness to pay for this type of disposal. Before the vehicle left the unloading area, another volunteer would collect the survey form the participant had filled out during unloading

Safety Issues To minimize congestion, confusion and the possibility of accidents or injuries, participants were asked to remain in their cars filling out their questionnaires during unloading. The project workgroup agreed that local public works employees or Envirocycle employees *only* be involved with unloading participants' vehicles and loading gaylord or pallets onto Envirocycle's trucks as concern for the potential for lifting injuries. This safety issue also involves site insurance concerns - while most local government-owned sites carry liability insurance sufficient to cover volunteers and facility users, worker compensation insurance typically does not cover volunteer workers. Volunteers were given a brief safety awareness training prior to their work shift.

To help ensure site safety, the following equipment was provided: reflective safety vests to identify all workers, reinforced-palm gloves for each worker handling equipment, signs and a dozen traffic flags for directing traffic flow, plastic orange cones to funnel traffic to and from designated drop-off areas. In addition, workers loading or unloading equipment were encouraged to wear heavy-duty or steel-toe work boots.

Weather Weather-related concerns included shelter (break areas out of weather) for volunteer staff and protection of materials being collected. The ideal situation (as in Binghamton) is to have vehicles drive-through into a covered building for unloading. Lacking that the workgroup envisioned that in poor weather, workers might load materials directly onto the tailgate of box-trailer/transport, volunteers load gaylords from there. This poses challenges for loading two-deep into the truck to maximize load.

2.6.2 Somerville logistics

The NRRA met with the Somerville Recycling Coordinator and Department of Public Works staff approximately two months prior to the first collection day. The Somerville public works facility was the site of the fall and spring collections. The site is centrally located, easily accessible and already serves as a drop-off site for traditional municipal recyclables and household hazardous waste. Lacking a building large enough to accommodate drive-through traffic and unloading activities, the Somerville collections were conducted in a spacious, paved open area.

A permanent HHW collection facility at the site increased its desirability. Experienced municipal solid waste managers know that no matter how carefully the public is educated and no matter how diligent the volunteers, hazardous waste may intentionally or unintentionally appear in any municipal recycling collection.

The Somerville site consisted of four zones:

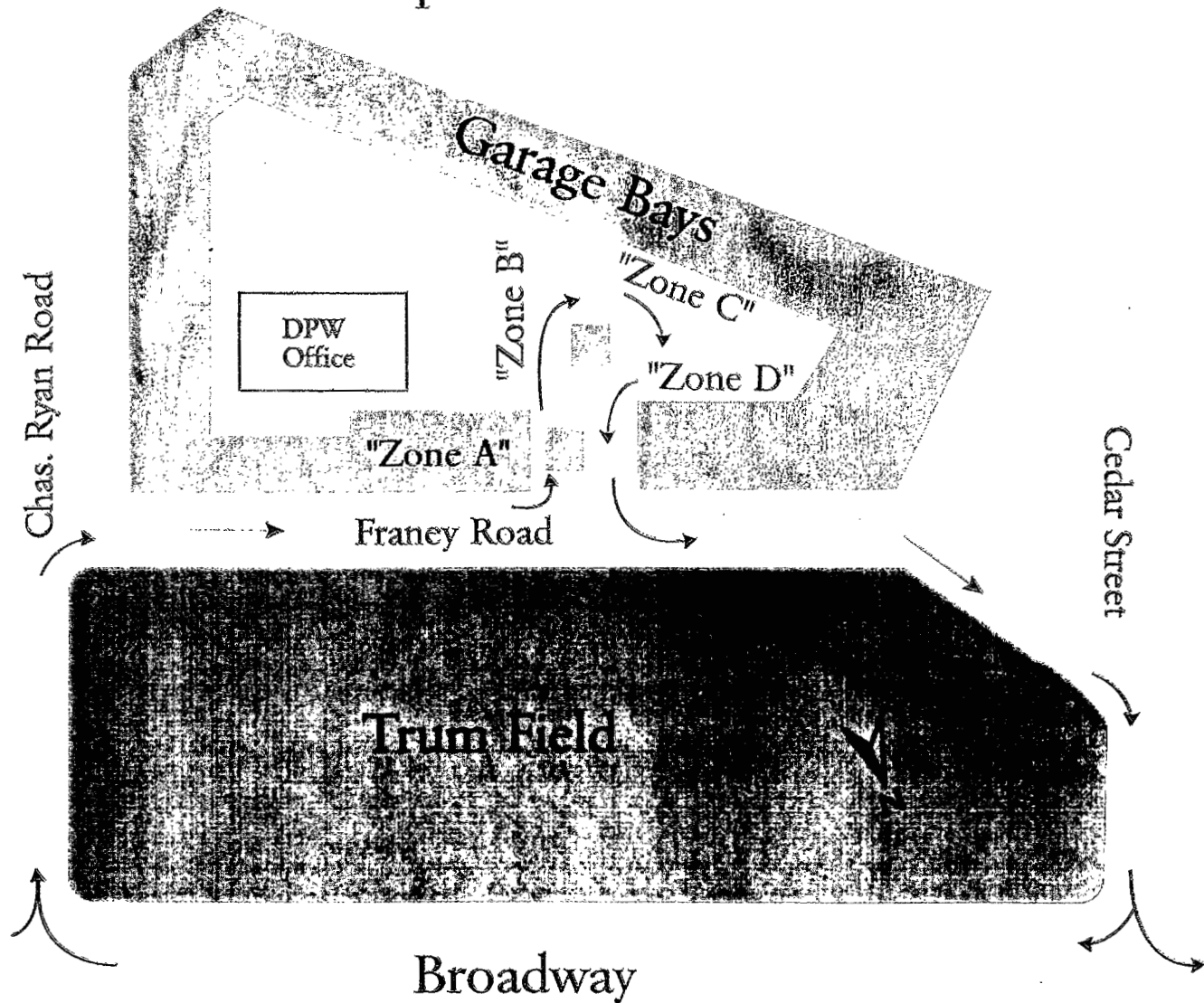
Zone A The entry to the site, where volunteers welcomed participants, answered questions, and distributed survey forms, clipboards and pencils to each vehicle. Because the facility is open on Saturdays to residents dropping off household recyclables such as paper, cans and bottles, planners special provisions for identifying at the gate and diverting participants in the pilot project to an area designated as the recycling area by means of volunteer "greeters" wearing bright orange safety vests.

Zone B The entry to the unloading zone, was staffed by a single volunteer who counted and logged the vehicles entering the unloading circle while directing drivers into the proper traffic lanes.

Zone C The unloading area, incorporated two u-shaped traffic lanes with a bank of gaylord storage boxes to the right of Lane 1's entry and the left of Lane 2's entry. The workgroup estimated this would provide enough space for 6 vehicles being unloaded simultaneously in each lane or two lanes of six vehicles. Zone C was staffed by 8 volunteers who completed the receiving manifest forms and stapled them to the survey forms collected from participants, unloaded the equipment from participants' vehicles and placed them into the appropriate gaylord boxes, and directed the vehicles around the U-turn and out of the zone.

Zone D The exit was staffed by one volunteer who directed traffic off the site.

Somerville D.P.W.
pilot collection site



Project coordinators planned equipment and staffing needs for the collection around a one percent participation rate - about 250 vehicles based on experience with their household hazardous waste collection days.

The workgroup calculated Somerville's equipment, staffing and supply needs and drew up the following list of equipment and supplies, assigning responsibility for each item to one of the pilot project partners, and indicating the zone where the material would be used on collection day:

TABLE 2.3 Somerville MA Equipment, Staffing and Supply Needs

Envirocycle	Zone	City of Somerville	Zone	NRRA	Zone
53' box trailer		6 folding tables	C	4 directional signs	A
box van truck with lift gate		10 folding chairs	C	24 clipboards	C
1 forklift	D	6 paperwork bins	C	6 staplers	C
2 pallet jacks	C	2 soda coolers	C	100 sharpened pencils	C
125 pallets	D	safety vests		24 pens	C
100 gaylord boxes	D	gloves and aprons		12 felt-tip markers	C
		2-way radios		surveys and manifests	C
		receipts (for businesses)		50 worker name tags	C
		stop signs		2 25-cup coffee urns	C
		traffic cones and flags		5 lbs. coffee	C
		extension cords		4 dozen donuts	C
				sugar, cream, stirrers	C
				8 large pizzas	C
				2 cases soda	C
				6 bags ice	C

Volunteers The workgroup estimated that the first Somerville collection day required 16 workers. Somerville planned to have four to six paid public works department employees onsite in addition to four NRRA staff members and five workgroup members who volunteered their time to staff this first collection. The community was fortunate to be able to draw from a core group from the Somerville Environmental and Recycling Volunteers (SERV), a long-time, well established volunteer organization in Somerville.

Volunteers and employees were instructed to arrive at the site by 8:00 a.m. on collection day for a brief training session before the gates opened to participants.

Envirocycle arrived at 7 a.m. on collection day to set up gaylords, pallets and trucks at the receiving site.

2.63 Binghamton

The NRRA met with the Broome County pilot program coordinator two months before the first collection day to begin logistical planning. Planning for the City of Binghamton reflected the political reality that the county, rather than individual municipalities, are charged with the responsibility for solid waste management in Broome County. The project workgroup agreed that, although direct mail and other outreach strategies would target Binghamton residents, the collection day would be open to all Broome County residents and small businesses.

The Broome County Transit Garage was utilized because of its central location, accessibility and previous use as a site for pilot collections of magazines and telephone books. The Transit Garage itself was spacious enough to keep the unloading, materials separation and loading operations and clerical support operations entirely under cover. Similar to Somerville, the site was divided into four zones:

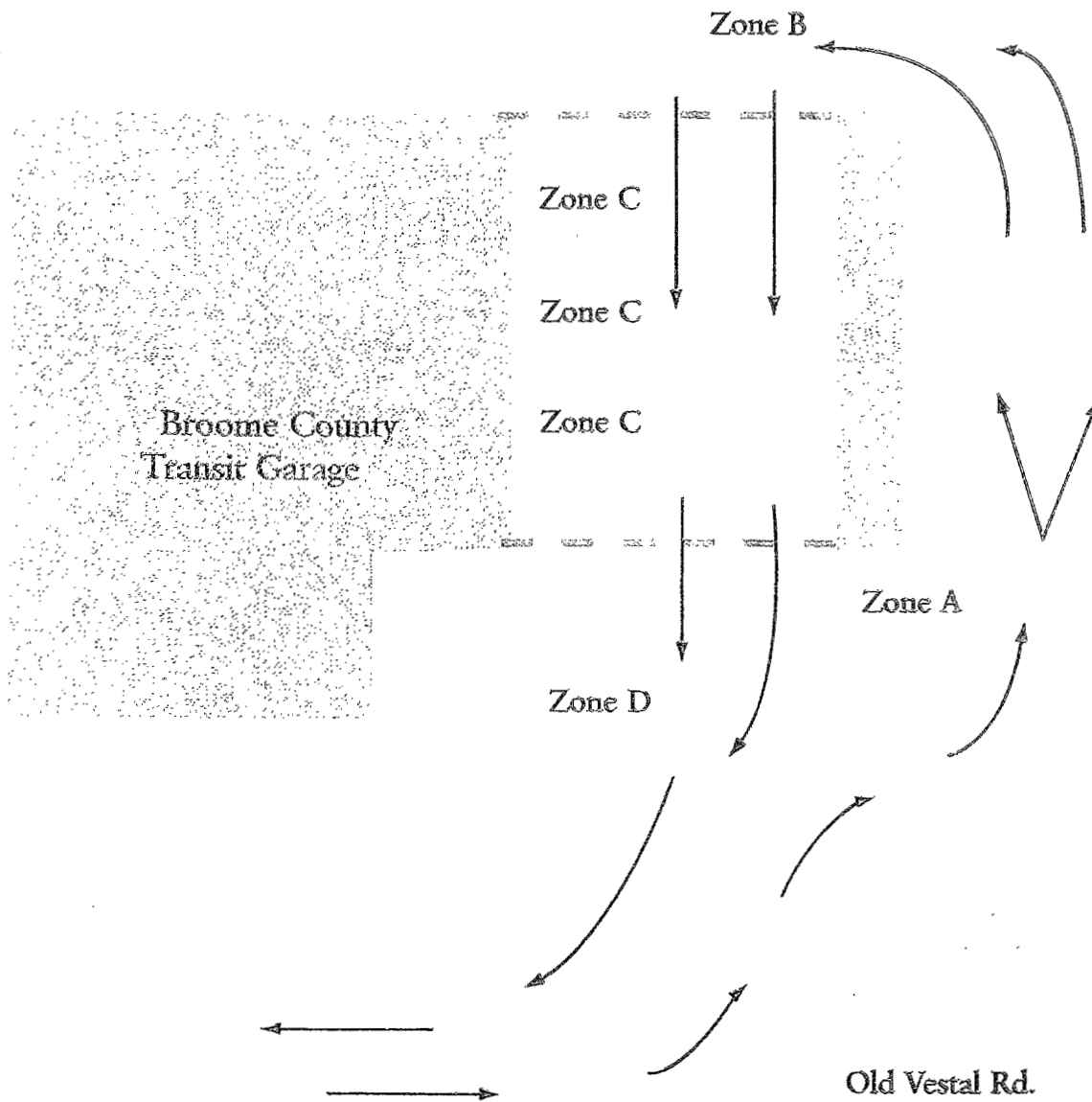
Zone A The entry to the site. Here two volunteers welcomed participants, answered any questions, distributed survey forms, clipboards and pencils, and collected the \$2/vehicle participation fee.

Zone B The entry to the unloading zone. This zone was staffed by a single volunteer who counted and logged the vehicles entering the unloading circle while directing drivers into the proper traffic lanes.

Zone C The completely enclosed unloading area. Coordinators planned two lanes of traffic with bays of storage gaylords on the outside (see attached diagram). Zone C was staffed by 10-12 volunteers who completed the receiving manifest forms and stapled them to the survey forms collected from participants, unloaded the equipment and placed them into the appropriate gaylord and directed the vehicles out through the bay doors.

Zone D The exit to the facility, was staffed by one volunteer who directed traffic out of the site.

City of Binghamton pilot collection site



Volunteers and Training Broome County is fortunate to have several area groups that serve as a source of volunteers for solid waste projects: a round table of business and industry leaders, a community college and a State university, and the County Environmental Management Board, a citizen advisory group. Planners recruited 40 volunteers from these groups.

Training: The Broome County collection ran two shifts of volunteers. The morning group arrived half an hour early for brief training session. They received a volunteer packet, including a zone map and brief description of volunteer duties at each zone. The project coordinators walked volunteers through the collection process, described the work required of workers at each zone and offered appropriate safety reminders (e.g., wear gloves at all times when unloading equipment, make eye contact with driver before crossing a traffic lane, call project supervisor before unloading any suspicious or unknown equipment from participant vehicle.) Afternoon volunteers "teamed up" with a morning shift to work for half an hour before the end of the morning shift.

Supplies and Equipment Envirocycle, NRRA and Broome county solid waste officials developed a comprehensive list of equipment and supplies, assigning responsibility for providing each item to one of the parties, and indicated the zone where the items would be used. Equipment needs were figured based on a one percent participation rate: 750 vehicles overall, with the capacity to unload 100-125 cars per hour.

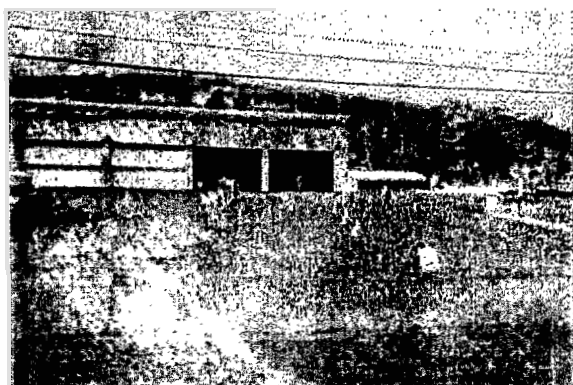
TABLE 2.4 Binghamton NY Equipment, Staffing and Supply Needs

Envirocycle	Zone	City of Somerville	Zone NRRA	Zone
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box van truck with lift gate		10 folding chairs	C 24 clipboards	C
1 forklift	D	6 paperwork bins	C 6 staplers	C
2 pallet jacks	C	2 soda coolers	C 100 sharpened pencils	C
125 pallets	D	safety vests	24 pens	C
100 gaylord boxes	D	gloves and aprons	12 felt-tip markers	C
		2-way radios	surveys and manifests	C
		receipts (for businesses)	50 worker name tags	C
		stop signs	2 25-cup coffee urns	C
		traffic cones and flags	5 lbs. coffee	C
		extension cords	4 dozen donuts	C
			sugar, cream, stirrers	C
			8 large pizzas	C
			2 cases soda	C
			6 bags ice	C

3.0 COLLECTION EVENTS

3.1 COMMODITIES COLLECTED

On the day of the collection, residents brought end-of-life electrical and electronic equipment to a central receiving facility where volunteers and workers recorded data and off-loaded the items from the residents' vehicles. Each piece of equipment was recorded on a receiving manifest by a volunteer. After the manifest was completed, other volunteers unloaded each vehicle and sorted equipment into premarked gaylords.



Entry/access to Binghamton collection site.



Unloading area at Somerville collection site, volunteers record data on receiving manifest.

Based on Envirocycle's experience recycling electronic equipment, about 20 percent of which is household electrical and electronic equipment received from service centers, list of eight categories were developed for sorting the incoming equipment: TVs & air conditioners, office equipment, large electronics, computer equipment, monitors and small TVs, small electronics, kitchen appliances and miscellaneous.



Gaylords set up to receive end-of-life equipment.



Larger end-of-life equipment was stored directly on pallets.

These categories were established to improve the efficiency of the demanufacturing process, and were derived from past history in processing electrical and electronic equipment. These categories are defined as follows:

1. **Large TVs/ACs** freestanding or console-style televisions, window air conditioners and Freon tanks
2. **Office Equipment** typewriters, telephones, answering machines, fax machines, electric staplers, office lighting devices, adding machines, electric pencil sharpeners and calculators
3. **Large Electronics** microwave ovens, VCRs, stereo equipment, including speakers and turntables
4. **Computer Equipment** printers, keyboards, disc drives, modems, cables and electronic storage devices (no monitors)
5. **Monitors/small TVs** computer monitors and tabletop or personal televisions
6. **Small Electronics** radios, tape recorders, clocks and clock radios, vacuum cleaners, sanders, drills, hair dryers, electric hair curlers, electric brooms, irons and electric toothbrushes
7. **Kitchen Appliances** coffee makers, griddles, toasters, toaster ovens, seal-a-meals, mixers, blenders, electric fry pans and waffle irons
8. **Miscellaneous** pinball machines, fans, dehumidifiers, electric heaters, small desk lamps, electronic toys, electronic musical equipment and other items

Overall, televisions, portable audio equipment, computers/monitors and VCRs were collected in the largest quantities. The following summarizes the receiving manifest data from all four collection pilots.

Table 3.1 CHARACTERIZATION RESULTS BY COMMODITY

	FALL 1996		SPRING 1997		TOTAL
	Somerville	Binghamton	Somerville	Binghamton	
HOME VIDEO					
Table Top TV	49	23	59	42	173
Floor Model TV	5	0	2	10	17
VCR	27	4	46	23	100
AUDIO					
Port. Radio/Tape/CD	58	1	36	82	177
Home Stereo	23	26	26	12	87
Tape Recorder	18	0	10	7	35
Car Audio/Tape	12	0	7	4	23
Speakers	23	3	17	6	49
Electronic Instruments	1	1	6	6	14
OFFICE					
PC/Computer	21	7	72	19	119
Monitor	17	8	52	33	110
Keyboard	18	7	44	26	95
Printer	12	2	40	9	63
Copier	0	0	1	0	1
Fax	0	0	1	1	2
COMMUNICATION					
Resident Phone	8	4	33	22	67
Business Phone	4	0	4	7	15
Cellular Phone	0	0	1	1	2
Cordless Phone	0	0	2	10	12
2-Way Radio	2	0	1	1	4
Answering Machine	4	4	31	8	47
HOME APPLIANCE					
Microwave Oven	12	3	12	12	39
Air Conditioner	8	0	19	8	35
Vacuum	17	2	7	18	54
SMALL COUNTER TOP APPLIANCE					
Toaster Oven	23	12	29	33	97
Can Opener	4	0	4	6	14
Coffee Maker	11	3	20	9	43
Food Processor	3	0	4	2	9
MISCELLANEOUS	10	35	213	101	
TOTAL	390	145	809	518	1862

Note that there were a myriad of small items that were not tracked, and account for the sometimes large number of other devices recorded in this table. These items included pinball machines, yogurt makers, juicers, other various and sundry kitchen appliances, make-up mirrors, humidifiers, dehumidifiers to name a few.

These items included pinball machines, yogurt makers, juicers, other various and sundry kitchen appliances, make-up mirrors, humidifiers, dehumidifiers to name a few.

3.2 SOMERVILLE - NOVEMBER 2, 1996

3.2.1 Summary

The detailed advance planning paid off. Every aspect of the collection event flowed smoothly. Fortunately, given the lack of adequate indoor space for unloading and storage in Somerville, the weather cooperated. Project coordinators could identify no aspect of the collection/storage/transportation equation they would have changed, with the exception of the generator survey as it slowed down traffic flow.

Participation consisted of 178 vehicles (which included a few bike-ins and walk-ins), and was lower than the recycling coordinator anticipated. Given that this was a new program offering, project coordinators felt this was in line with the 200-250 who typically participate in the once-a-month household hazardous waste collections and previous special collections.

Participant surveys revealed that 74 percent of participants had learned about the collection event through the flyer; 20 percent through the media.



Somerville DPW staff unloading participants vehicles.



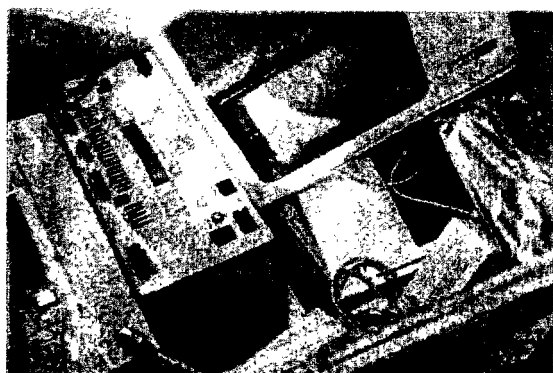
Envirocycle staff unloading and sorting end-of-life equipment.

3.22 Materials Collected

Large TVs, air conditioners, large electronics, and miscellaneous dominated this collection event. The exact classes are as follows:

TABLE 3.2 Somerville Fall 1996 Collection Summary

CATEGORY	Item count	Weight	% By Weight
Large TV's/AC's	13	1,665	23%
Office Equipment	8	266	4%
Large Electronics	73	1,196	16%
Computer Equipment	30	852	11%
Monitors/Small TVs	87	631	8%
Small Electronics	41	738	10%
Kitchen appliances	105	694	9%
Miscellaneous	33	1,406	19%
TOTAL	390	7,448	



Materials collected in a gaylord.



End-of-life equipment collected.

3.3 BINGHAMTON - NOVEMBER 9, 1996

3.3.1 Summary

Overall, the event ran smoothly and efficiently, with a total of 40 cars from Binghamton participated. The fact that the collection was open to all of Broome County boosted overall participation to 118. Several factors conspired to reduce Binghamton's participation rate:

- a. terrible weather: rain and snow showers
- b. a highway construction project adjacent to the collection site, which made access inconvenient
- c. the fact that Binghamton residents have not been conditioned to take trash or recyclables to the public works garage selected as the site for the collection: residents do not have access to a drop-off recycling facility as residents in Somerville do
- d. the high school football championship was held the same day, competing for residents' time and attention
- e. the \$2 fee collected from each vehicle; Binghamton's project coordinator believes that the \$2 per vehicle charge for drop-off was a disincentive to participation, despite the fact that Broome County already charges fees for HHW drop-off and for tires dropped off at the County landfill. ABinghamton residents can set out bulky wastes for curbside pickup at any time for no charge. The \$236 collected in participant fees went into the Broome County recycling education and outreach program.

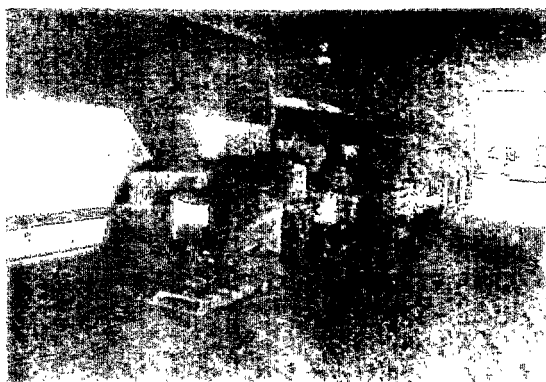
Event day surveys revealed that 68 percent of Binghamton participants learned about the collection pilot through the flyer, 22 percent through media and 10 percent through friends or other means.

3.3.2 Materials Collected

Large TVs and air conditioners were the single largest category in this collection event.

TABLE 3.3 Binghamton Fall 1996 Collection Summary

CATEGORY	Item count	Weight	% by weight
Large TV's/AC's	13	893	37%
Office Equipment	4	102	4%
Large Electronics	33	205	9%
Computer Equipment	9	339	14%
Monitors/Small TVs	25	226	10%
Small Electronics	15	134	6%
Kitchen appliances	3	162	7%
Miscellaneous	43	311	13%
TOTAL	145	2,372	



Larger equipment is shrink wrapped prior to transport.



End-of-life equipment being loaded onto tractor trailer for transport.

3.4 SOMERVILLE - APRIL 19, 1997

3.4.1 Summary

Rain, high winds and frigid temperatures may have deterred participation at the second collection event. The weather necessitated clearing three equipment bays in the public works garage for storing gaylords and pallets of materials prior to loading onto Envirocycle's trucks. To alleviate weather stress on volunteers, project managers rotated the AgreetersA and traffic control positions with warm, dry replacements every half hour throughout the day.

To accommodate the change in unloading areas, the Somerville project manager routed the traffic flow clockwise. Because American drivers are accustomed to moving counterclockwise around traffic circles and roundabouts, this directional change caused some confusion.

Despite the weather and the traffic flow challenges, Somerville's second collection day proceeded very smoothly. In fact, the pilot project has convinced the city to incorporate periodic collections into its solid waste management planning.

The pilot group chose to eliminate the press release, press conference and cable TV outreach of the fall collection (as noted above, Somerville residents get their news from Boston's TV, radio stations and newspapers; mass media has traditionally not been useful for communicating local information to residents; direct mail has been much more successful.) In addition, for comparability no public service announcements were used in Binghamton to advertise the event.

Participation in the spring collection increased from 193 to 250, a 21% increase, despite

the bad weather and lack of press outreach. The weight of materials collected nearly doubled, from 7,448 lbs. in November to 13,723 lbs. in April. Eight-nine percent of participants learned about the spring collection from direct mail flyers.

The spring collection participants from each vehicle were surveyed on their willingness to pay for this services. The survey question on willingness to pay revealed that of 146 respondents, 118 were willing to pay between \$1 and \$5 for drop-off, 27 were willing to pay between \$5 and \$10 for drop-off and 2 were willing to pay over \$10 for drop-off of EOL equipment.

3.4.2 Materials Collected

Large TVs, air conditioners, and computer equipment dominated this collection event. Over 1,000 pounds of resalable electronic items were received.

TABLE 3.4 Somerville Spring 1997 Collection Summary

CATEGORY	Item count	Weight (lbs)	% by weight
Large TV's/AC's	21	3,508	28%
Office Equipment	36	619	5%
Large Electronics	89	762	6%
Computer Equipment	84	3,529	28%
Monitors/Small TVs	183	1,158	9%
Small Electronics	70	584	4%
Kitchen appliances	57	362	3%
Miscellaneous	269	2,132	17%
SUBTOTAL	809	12,654	
Reuse		1,069	
TOTAL		13,723lbs.	

3.5 BINGHAMTON - MAY 10, 1997

3.5.1 Summary

Logistically, planners maintained substantially the same format. As a strategic move to determine if dropping the \$2 fee would encourage participation, Binghamton/Broome County dropped the \$2 per vehicle charge during the spring collection.

With better weather, elimination of the fee, no on-site construction or nearby highway paving to create traffic bottlenecks and no competing community events, participation among Binghamton residents nearly tripled from 47 to 128, which included 10 who had also participated in the fall collection. Participation throughout the rest of Broome County nearly doubled, from 118 to 229, with 24 repeat participants. The total weight of materials collected in Binghamton increased from 2,372 to 9,031 lbs.

The spring collection participants from each vehicle were surveyed on their willingness to pay for this services. The survey question on willingness to pay revealed that of 76 respondents, 62 were willing to pay between \$1 and \$5 for drop-off, 5 were willing to pay between \$5 and \$10 for drop-off and 1 was willing to pay over \$10 for drop-off of EOL equipment.

3.5.2 Materials Collected

Large TVs, air conditioners, and computer equipment were the predominant categories collected.

TABLE 3.5 Binghamton Spring 1997 Collection Summary

CATEGORY	Item Count	Weight	% By Weight
Large TVs/ACs	18	2,932	33%
Office Equipment	16	0	0%
Large Electronics	41	878	10%
Computer Equipment	35	1,487	16%
Monitors/Small TVs	94	1,177	13%
Small Electronics	111	761	8%
Kitchen appliances	50	1,090	12%
Miscellaneous	153	706	8%
TOTAL	518	9,031	

3.6 SUMMARY OF PARTICIPATION AND MATERIALS COLLECTED

Weight comparisons by community and collection date are shown below.

TABLE 3.6 Weight Comparison

LOCATION	FALL '96	SPRING '97	% Increase
Somerville	7,448 lbs.	13,723 lbs.	84%
Binghamton	2,372 lbs.	9,031 lbs.	281%

Another aspect of the collection was to determine the origin of the residents contributing to the collection event.

TABLE 3.7 Origin of Participant

	HOUSEHOLDS	APARTMENT	BUSINESS
Somerville Fall >96	62%	38%	0%
Somerville Spring >97	50%	48%	2%
Binghamton Fall >96	66%	26%	8%
Binghamton Spring >97	81%	16%	3%

The most effective communication method was the mass communication flyer, with general media communication being a distant second.

TABLE 3.8 Effective Communication

	FLYER	MEDIA	FRIEND	OTHER
Somerville Fall '96	74%	20%	3%	3%
Somerville Spring '97	88%	8%	3%	1%
Binghamton Fall '96	68%	22%	5%	5%
Binghamton Spring '97	57%	34%	4%	5%

This study also tracked the number of households included in each vehicle.

TABLE 3.9 Households vs. Vehicles

	HOUSEHOLDS	VEHICLES	ADDITIONAL HOUSEHOLDS
Somerville Fall '96	193	178	15
Somerville Spring '97	250	212	38
Binghamton Fall '96	47	40	7
Binghamton Spring '97	128	114	14

This table compares the participating households to the total number of households.

TABLE 3.10 Participating Household vs. Community Household

	HOUSEHOLDS IN COMMUNITY	HOUSEHOLDS PARTICIPATED Fall '96	Spring '97
Somerville	31,000	193	250
Binghamton	25,000	47	128

Finally, generally over half of the participants were willing to support the collection through a cash payment. A comparison of the willingness to pay for the Spring collections follows.

	Total Surveyed	Would Pay	\$1-5	\$5-10	>\$10
Somerville April '97	212	146	118	27	2
Binghamton May '97	114	76	62	5	1

4.0 DEMANUFACTURING/REUSE/DISPOSAL OF MATERIAL COLLECTED

The EOL electrical and electronic equipment collected in the four events were transported to a single demanufacturing facility, Envirocycle's facility in Hallstead PA.

4.1 TRANSPORTATION

The EOL was loaded onto Envirocycle's truck at the end of each collection event. The equipment was trucked in by one tractor-trailer and a 53-foot van trailer.

4.2 DEMANUFACTURING

After the equipment was delivered to the facility, each of the eight category of items was weighed, demanufactured. The plan was to demanufacture all the post-consumer electrical and electronic equipment collected to determine their economic value. Each category was weighed, then disassembled into its components or materials then recycled for its content. Envirocycle also recorded the labor necessary to weigh and disassemble the EOL items from each collection event.

All materials were recycled with the exception of the wood (which was derived primarily from console TVs). In the vicinity of Envirocycle's facility in Pennsylvania, the practice is to dispose of this wood at a local Municipal Solid Waste landfill.

Definitions of material streams resulting from demanufactured electrical and electronic equipment are listed below alphabetically:

Aluminum: a light-weight metal that conducts electricity but doesn't rust
Battery: converts chemical energy into electrical energy
Capacitors: stores direct electric energy
Carcass/low grade boards: housing or frame for the electronics device
Cast Aluminum: a heavier type of aluminum that is less malleable
Clean Plastic: plastic that is homogenous and free of all contaminants
Copper: reddish, malleable, ductile metal mostly used as an electrical conductor
CRT: output device that converts electric signals into visual form. The CRT consists of three types of glass, and is at a very low pressure.
Disc Drives: computers store information on a metal or plastic disk
Fans: an electric motor with a multi-armed blade attached to move air
Freon Tanks: storage device for refrigerant chemicals
Metal: various grades of scrap metal
Motors: device that transfers electric energy into motion
Phone Plastic: black and white plastic dismantled from a telephone
Power Supply: converts alternating current into direct current
Radiators: dissipate heat energy generated by the electronic device
Refine Boards: a higher grade of boards (i.e. mother board, processors) with much more metals value
Scrap Plastic: pieces of plastic that are contaminated with paint, connectors, or foam or has two different types of plastic molded together
Toner Cartridge: a plastic cartridge used to hold ink or carbon for copiers and fax machines
Transistors: semiconductors housed in a metal case with wire leads
Wire: insulated metal strips or cables that carries electricity within the device
Yokes: copper and steel metal assembly at the neck of the CRT

The four collection events captured over 32,000 lbs. of electrical and electronic equipment, which were demanufactured into twenty three recyclable commodities. Table 4.1 shows the summary composition by percent weight of each commodity.

TABLE 4.1 Summary of Weights of Separated Post-Consumer Electronics

	SOMERVILLE FALL '96	BINGHAMTON FALL '96	SOMERVILLE SPRING '97	BINGHAMTON SPRING '97	TOTAL WEIGHTS	% OF TOTAL WEIGHT
WOOD						
wood	513	300	96	636	1,545	4.90%
subtotal	513	300	96	636	1,545	4.90%
CRTs						
CRT's	792	688	1,226	1,136	3,842	12.19%
subtotal	792	688	1,226	1,136	3,842	12.19%
PLASTIC						
scrap plastic	674	105	1,529	1,797	4,105	13.03%
carcass	714	294	1,672	1,039	3,719	11.80%
clean plastic	310	211	904	1,169	2,594	8.23%
phone plastic	7	0	0	0	7	0.02%
subtotal	1,705	609	4,105	4,005	10,424	33.09%
METAL						
metal	2,554	351	3,805	1,571	8,281	26.28%
motor	395	263	360	255	1,273	4.04%
wire	241	45	281	307	874	2.77%
aluminum	114	10	183	134	441	1.40%
cast aluminum	0	23	0	0	23	0.07%
copper	102	2	328	130	562	1.78%
disk drive	132	36	272	0	440	1.40%
transformers	375	0	524	257	1,156	3.67%
yokes	65	0	193	171	429	1.36%
fans	35	0	141	64	240	0.76%
radiators	164	0	877	162	1,203	3.82%
freon tanks	99	0	254	88	441	1.40%
subtotal	4,276	729	7,218	3,139	15,362	48.76%
OTHER						
refine boards	142	25	0	67	234	0.74%
power supply	0	21	0	0	21	0.07%
capacitors	13	0	9	16	38	0.12%
batteries	4	0	0	0	4	0.01%
toner	3	0	0	32	35	0.11%
subtotal	162	46	9	115	332	1.05%
Subtotals	7,448	2,372	12,654	9,031	31,505	100%
PLUS RESALE			1,069		1,069	
TOTALS	7,448	2,372	13,723	9,031	32,574	100%

Finally, we present the data by category for each collection dates in Tables 4.2, 4.3, 4.4 and 4.5 to provide a finer level of detail.

**SOMERVILLE:
SPRING '97**

TABLE 4.2 Somerville Fall 1996 Materials and Weights Collection Data

WEIGHT IN LBS:

AVG VALUE	ITEM	LG TV's/ AC's	OFFICE EQUIPMENT	LARGE ELECTRONICS	COMPUTER EQUIPMENT	MONITORS/ SMALL TV's	KITCHEN ELECTRONICS	SMALL ELECTRONICS	MISC	TOTAL
0.005	scrap plastic	170	22	64	25	121	98	94	80	674
0.030	carcass	85	23	96	129	104	24	131	122	714
0.018	metal	392	86	556	380	40	377	139	584	2,554
-0.075	wood	19		13			8	76	397	513
0.125	phone plastic	412		14	18	233		6	1	7
0.056	CRT's	28	21	65	28	49		115		792
0.175	clean plastic	39	11	140	6	11	49	24	46	310
0.040	motor	52	4	37	29	20	89	33	66	395
0.165	wire	2	14	16	24	3	27	39	33	241
0.375	aluminum	99	3				22	25	8	114
0.240	cast aluminum									0
0.575	copper									102
1.000	refine boards		35	23	64	3		10	7	142
0.200	disk drive		29		103					132
0.060	power supply									0
0.030	transistors	45	11		37	22		32	60	375
0.17	yokes	26		168	1	25		12		65
0.035	capacitors	3		1	1			1		13
0	batteries			3	6			1		4
0.085	fans	30	2		1				2	35
0	toner		2		1					3
0.15	radiators	164	3		1					164
-0.25	freon tanks	99								99
	TOTALS	1,665	266	1,196	852	631	694	738	1,406	7,448

TABLE 4.3 Somerville Spring 1997 Materials and Weights Collection Data

SOMERVILLE: SPRING '97		WEIGHT IN LBS:							
AVG VALUE	ITEM	LG TV's/ AC's	OFFICE EQUIPMENT	LARGE ELECTRONICS	COMPUTER EQUIPMENT	MONITORS/ SMALL TV's	KITCHEN ELECTRONICS	SMALL ELECTRONICS	TOTALS
0.005	scrap plastic	85	39	219	428	7	88	188	1,529
0.030	carcass	76	267	325	219	47	40	98	1,672
0.018	metal	965	30	41	1,904		86	69	3,805
-0.075	wood	96							96
0.125	phone plastic								0
0.056	CRT's	320				906			1,226
0.175	clean plastic	246		15	278	42	36	68	904
0.040	motor		71	70	100		35	34	360
0.165	wire	78			50	27	17	61	281
0.375	aluminum		42		91		30	20	183
0.240	cast aluminum								0
0.575	copper	328							328
1.000	refine boards								0
0.200	disk drive		100	72	100				272
0.060	power supply								0
0.030	transformers		70	20	359		30	15	524
0.17	yokes	64				129		9	193
0.035	capacitors								9
0	batteries								0
0.085	fans	119						22	141
0	toner								0
0.15	radiators	877							877
-0.25	freon tanks	254							254
	SUBTOTALS	3,508	619	762	3,529	1,158	362	584	12,654
	PLUS RESALE								1,069
	TOTALS	3,508	619	762	3,529	1,158	362	584	13,723

TABLE 4.4 Binghamton Fall 1996 Materials and Weights Collection Data

SOMERVILLE: SPRING '97		WEIGHT IN LBS:								
AVG VALUE	ITEM	LG TV's/ AC's	OFFICE EQUIPMENT	LARGE ELECTRONICS	COMPUTER EQUIPMENT	MONITORS/ SMALL TV's	KITCHEN ELECTRONICS	SMALL ELECTRONICS	MISC	TOTALS
0.005	scrap plastic	5	6	16	25	14	18	15	6	105
0.030	carcass	25	35	116	12	26		72	8	294
0.018	metal	25	38	4	79	17	107	8	74	351
-0.075	wood	300								300
0.125	phone plastic									0
0.575	CRT's	538				150				688
0.175	clean plastic		6	14	125	14	20	20	12	211
0.040	motor		18	30			11		204	263
0.165	wire			6	11	5	6	10	7	45
0.375	aluminum			5	5					10
0.240	cast aluminum			12				11		23
0.575	copper			2						2
1.000	refine boards				25					25
0.200	disk drive				36					36
0.060	power supply				21					21
0.030	transistors									0
0.170	yokes									0
0.035	capacitors									0
0.000	batteries									0
0.085	fans									0
0.000	toner									0
0.150	radiators									0
-0.250	freon tanks									0
	TOTALS	893	102	205	339	226	162	135	311	2,372

TABLE 4.5 Binghamton Spring 1997 Materials and Weights Collection Data

SOMERVILLE: SPRING '97		WEIGHT IN LBS:									
AVG VALUE	ITEM	LG TV's/ AC's	OFFICE EQUIPMENT	LARGE ELECTRONICS	COMPUTER EQUIPMENT	MONITORS/ SMALL TV's	KITCHEN ELECTRONICS	SMALL ELECTRONICS	MISC	TOTALS	
0.005	scrap plastic	420		176	292	254	385	180	90	1,797	
0.030	carcass	132		110	144	70	230	184	169	1,039	
0.018	metal	277		371	426		175	142	180	1,571	
-0.075	wood	473				33		80	50	636	
0.125	phone plastic									0	
0.575	CRT's	640				496				1,136	
0.175	clean plastic	396		75	275	205	80	75	63	1,169	
0.040	motor			50	75		70	45	15	255	
0.165	wire	78		4	80	60		55	30	307	
0.375	aluminum						70		64	134	
0.240	cast aluminum									0	
0.575	copper	130								130	
1.000	refine boards				55				12	67	
0.200	disk drive									0	
0.060	power supply									0	
0.030	transistors			60	100		64		33	257	
0.170	yokes	112				59				171	
0.035	capacitors						16			16	
0.000	batteries									0	
0.085	fans	24			40					64	
0.000	toner			32						32	
0.150	radiators	162								162	
-0.250	freon tanks	88								88	
	TOTALS	2,932	0	878	1,487	1,177	1,090	761	706	9,031	

4.3 REUSE

When equipment was dropped off, residents were asked via the survey if the items were working. For Somerville, 28% were working, 35% were not working, and 37% were listed as unknown if they operated or not. Binghamton had similar results: residents reported that 30% were working, 59% were not working, and 11% were unknown. This indicates that there may be reason to pursue the reuse or resale of items collected in these events.

In addition, one collection event did result in resalable items based on the demanufacturers evaluation. Envirocycle determined that a portion of the captured material from Somerville's spring collection had economic value as a resale item. These items were diverted from the demanufacturing process, and were sold for their value as a device. All other captured material from this and the other three collections was demanufactured for the material value of the separated materials. This occurred in all cases except for a fraction of the Somerville spring collection. In this one case, 1,069 lbs. of the collected material was resold without demanufacturing.

4.4 FINAL DISPOSITION

Envirocycle's corporate policy is maximize reclamation and recycling of the demanufactured materials. Generally, 99.9% of CRTs are recycled back into glass cullet for the manufacture of new CRTs and the remaining 0.01% is glass fines that are sent to a primary lead smelter. All metals were sent to a local metal scrap dealer for shredding and reclamation through various smelting processes. High grade boards, power supplies and disc drives were sent to a precious metal refiner for metals reclamation. Low grade boards were sent to a second demanufacturer for processing or to an overseas market for reuse. Freon tanks were managed by a vendor for the proper reclamation of CFCs. Toner cartridges were sent to a vendor for repair and refurbishment. Batteries were managed through a industry battery recycling program. Remaining plastics were sorted and grinded in-house and sent to a plastics recycler for additional regrinding to meet specifications for recycled feedstock.

The only item that was disposed of from the demanufacturing process was the wood. This wood includes the console of the TV, decorative wood strips, incidental wood, handles, and similar items. Envirocycle separated these items and disposed of the wood at a local Municipal Solid Waste landfill.

5.0 ECONOMIC EVALUATION OF THE PILOT COLLECTIONS

The second and third goal of the pilot collections were to assess the economic viability of collecting, transporting, demanufacturing and recycling end-of-life electrical and electronic equipment. The following discussion evaluates the economics of the pilot collections.

5.1 COSTS AND REVENUE INCLUDED IN ECONOMIC ANALYSIS

The economic analysis presented here includes only those costs and revenues incurred from the time the equipment left the collection site, including:

1. Revenues from sale of demanufactured components
2. Costs for demanufacturing labor
3. Costs for transporting collected items from the host community to Envirocycle's facility in Hallstead PA.

Costs that are not included in this economic analysis, but should be incorporated into any projections by a community intending to sponsor a collection event for electrical and electronic equipment include:

4. Internal community costs, such as research, investigation, meeting time, volunteer coordination, telephone costs, etc.
5. Public relations: all costs involved with writing, printing and distribution or educational/promotional materials, direct contact, etc.
6. Event costs, including use of space, labor, electricity, telephone, refreshments, use of equipment, insurance, disposal of non-recyclable items (including hazardous materials), etc.

These latter costs will vary from community to community, depending on program design. This analysis didn't include them because this was a pilot collection effort and would have necessitated including the unusual costs of creating and refining the methods, approaches, concepts and details that developed these pioneering collection events.

One other potential cost is managing hazardous constituents (i.e. PCBs) if they are in the equipment collected. This may include additional shipping and disposal costs if collected materials to ensure proper transport and disposal. The pilot collections did not collect any hazardous constituents that required special handling, i.e. PCBs, RCRA defined hazardous waste.

5.2 UNIT MARKET VALUE OF RECOVERED MATERIALS

The eight categories of post consumer electrical and electronic equipment are listed by the economic value of their components. Envirocycle demanufactured post-consumer materials and attempted to categorize the materials in a consistent manner. The company also provided a range of value for each of the demanufactured components. We've selected a mid-range value to use in this economic analysis to avoid understating or overstating the value of the components. The value will vary according to the quality of the demanufacturing process, market conditions at the time of sale and regional markets for demanufactured components.

The value of the components is integral to the economic analysis needed prior to establishing a consumer electrical and electronic equipment collection event. The information contained here is a guideline to the relative value of materials recovered from the demanufacturing of post-consumer electrical and electronic equipment.

TABLE 5.1 Average Market Value (provided by Envirocycle):

Note that all values represent the value paid to the demanufacturer for the separated components free-on-board at their loading dock unless specified otherwise.

Commodity	Range	Average
Clean Plastic:	.05-.30 per lb.	\$0.175/lb.
Refine Boards:	.50-1.50 per lb.	1.00
Toner Cartridge:	no value	
Battery:	no value	
Fans:	.07-.10 per lb.	0.09
Disc Drives:	.15-.25 per lb.	0.20
Phone Plastic:	.05-.20 per lb.	0.13
Cast Aluminum:	.20-.28 per lb.	0.24
Wood (unable to recycle):	disposal cost of .05-	-0.08
CRTs: (see below)	.056/lb.	
Metal:	.01-.025 per lb.	0.02
Carcass:	.01-.05 per lb.	0.03
Scrap Plastic:	.00-.01 per lb.	0.01
Transistors:	.01-.05 per lb.	0.03
Wire:	.15-.18 per lb.	0.17
Aluminum:	.35-.40 per lb.	0.38
Yokes:	.15-.19 per lb.	0.17
Motors:	.03-.05 per lb.	0.04
Capacitors:	.02-.05 per lb.	0.04
Copper:	.55-.60 per lb.	0.58
Radiators:	.15 per lb. *	0.15
Power Supply:	.06 per lb. *	0.06
Disposal		
Freon Tanks:	cost of 0.25\$ per lb.*	-0.25

NOTE: *All of these prices were obtained from Envirocycle and are ranges depending on the various material grades and market conditions at a given time. For the purpose of attaching values to the materials collected, the average price for each was used, since the breakdown of materials did not include the amount of high grade vs. low grade materials.

CRT Value: Based on Envirocycle's proprietary process for processing CRT glass, the company did not share cost and revenue information. For the purpose of attaching a value to CRT's, Envirocycle indicated that we could obtain an approximate value for these by obtaining market prices on silica and CRT glass (which are the items in CRT). The average market rate of \$.056/lb. This is based on one CRT weighing approximately 20 lbs. each, which has approximate value of \$1.10/CRT.

5.3 TRANSPORTATION COSTS

One tractor-trailer truck was used for each collection.

Somerville MA It cost Envirocycle \$645.84 to move a truck from Somerville, MA to their plant in Hallstead, PA. The rate from Somerville was \$2.07/mile, 312 miles total.

Binghamton NY It cost \$96.25 to move the truck from Binghamton NY to Hallstead PA. The rate from Binghamton was \$2.75/mile, 35 miles total.

For the purpose of determining the transportation costs listed in the spreadsheet, the total transportation cost for each collection was included on a per truck basis. The type of truck that was used for the collection pilots was a 53-foot van trailer. The maximum payload that this type of truck can carry is 45,000 pounds. However, based on the bulky nature of this material Envirocycle's experience is that the maximum payload is approximately 25,000 pounds. For illustration, the spring Somerville collection of 13,723 pounds completely filled the trailer, but note that due to the lack of a fork lift operator the pallets and gaylords were single stacked.

5.4 LABOR COST

Labor cost for the purposes of this study include only Envirocycle's costs for labor at their facility, and do not include any labor by any party at the collection event, transportation labor or loading labor.

The labor cost per hour of \$26.50 includes all Envirocycle's wages and overhead at their facility: unloading the truck, storing the materials, demanufacturing the units and placing the separated components into gaylords or similar units for shipment to a consuming mill or recycler. It is likely that other demanufacturers may quote different costs.

This labor cost is the direct manufacturing cost, and does not include any general and administrative overhead, contribution margin, sales and marketing costs, commissions, fees, licenses, insurance, accounting or other costs.

TABLE 5.2 Demanufacturing Labor Analysis

Collection event	lbs. collected	hours demanufacturing	lb./hour
Somerville Fall 1996	7,448	118.3	63
Somerville Spring 1997	12,654	85	148.9
Binghamton Fall 1996	2,372	31.5	75.3
Binghamton Spring 1997	9,031	111	81.4
Total	31,505	345.8	Average: 92.2 lb./hr.

While the average person demanufacturing post-consumer electrical and electronic equipment could expect to dismantle 92.2 lb./hour. Envirocycle utilized the same five staff members to demanufacture all the equipment collected from each pilot in an attempt to achieve parity among the labor hours. One notable trend is that the staff increased productivity, as the learning curve, decreased over time. Note that the highest productivity occurred during the Spring Somerville collection is attributed to the categories of equipment collected, most notably computer equipment which made up 28% of that collection and can traditionally be demanufactured more efficiently.

5.5 SOMERVILLE ECONOMIC EVALUATION

5.5.1 Somerville Solid Waste and Recycling Costs

Currently, Somerville solid waste is collected curbside by the city and is tipped at a local transfer station at a cost of \$27.00 for collection and a tip fee of \$45.85/ton for a total cost of \$72.85 per ton. Recyclables are also collected by contracted hauler at the curb side at a cost of \$67.00/ton and tipped at \$22.50/ton for a total cost of \$89.50/ton. The cost of garbage and recyclables collection is generated from the tax base and is provided as a city service.

5.5.2 Fall 1996 Collection

The fall collection event in Somerville collected 7,448 pounds of material.

This collection event is shown having the these relative economic values.

Revenues from sale of demanufactured components:	\$481.43
Costs: demanufacturing labor	(3134.95)
transportation from host facility to Envirocycle	(645.84)
NET VALUE (COST)	\$3,299.36
or a cost of \$0.44/lb or \$886/ton for the 7,448 lbs. collected at this event.	

Spring 1997 Collection

This second collection event captured 84% more electrical and electronic equipment than the first collection in the fall of 1996. Many participants had brought materials to the fall collection, and came back to the spring collection with additional items. 1,069 lbs. of this collection had value as resalable item, specifically, : central processing units (CPUs) and monitors. These were sold by Envirocycle, and a value of \$0.90/lb. was attributed to these items as a revenue to the collection event.

Revenues from sale of demanufactured components:	\$845.32
Costs: demanufacturing labor	(2252.50)
transportation from host facility to Envirocycle	(645.84)
NET VALUE (COST)	(\$2,053.02)
or a cost of \$0.16 or \$324/ton for the 12,654 lbs demanufactured	
INCLUDING RESALE	
Revenue from resale of items	
or \$0.90/lb for 1,069 lb collected	962.10
NET VALUE (COST)	(\$1,090.92)
or a cost of \$0.08/lb or \$159/ton for the 13,723 lbs. Resold and demanufactured	

5.6 BINGHAMTON ECONOMIC EVALUATION

5.6.1 Binghamton Solid Waste and Recycling Costs

The City of Binghamton instituted a pay per bag system in 1991. Residents pay a per bag fee of \$1.17/32 gallon bag which covers the costs of collection of all garbage, bulk items and recyclables for city residents. Binghamton's solid waste is collected curbside by the city at a cost of approximately \$90.00/ton. The tip fee at the Broome County owned and operated landfill is \$40.00/ton for a total cost for collection and disposal of \$35.00/ton for a total cost of \$75.00/ton.

5.6.2 Fall 1996 Collection

This first collection event in Binghamton collected less than the subsequent event due to the fact that this was the first event of this type held in this community.

Revenues from sale of demanufactured components:	\$487.25
Costs: demanufacturing labor	(834.75)
transportation from host facility to Envirocycle	(96.25)
NET VALUE (COST)	(\$443.75)
or a cost of \$0.19/lb or \$374/ton for the 2,372 lbs. collected	

5.6.3 Spring 1997 Collection

This collection grew by almost three times the fall collection, from 2,372 lbs. to 9,031 lbs. Again, the contributing factors include the fact that this was the second collection, the weather was greatly improved, the collection fee was eliminated and many participants had recycled items at the previous event in the fall.

Revenues from sale of demanufactured components:	1,175.00
Costs: demanufacturing labor	-2,941.50
transportation from host facility to Envirocycle	(96.25)
NET VALUE (COST)	(1,862.09)

or a cost of \$0.21/lb or \$412/ton for the 9,031 lbs. collected.

5.7 SUMMARY

It is important to note that revenues vary greatly depending most significantly on the value of the resalable items, and, to a less extent, on the relative value of the recyclable items that are demanufactured. Transportation costs also greatly impact the entire collection economics.

Economic factors include where the collections take place, distance to and from demanufacturers, number of volunteers vs. paid workers, and market conditions, the largest variable is the potential value of resalable items that can be captured.

TABLE 5.7 Summary Values INCLUDING Resale:

Collection event	lbs. collected	Revenue (Cost)	Revenue/lb. (Cost)/lb	Revenue/ton Cost/ton
Somerville Fall 1996	7,448	(\$3,299.36)	-0.44	(\$886/ton)
Somerville Spring 1997	13,723	(\$1,090.92)	-0.08	(\$159/ton)
Binghamton Fall 1996	2,372	(\$443.75)	-0.19	(\$374/ton)
Binghamton Spring 1997	9,031	(\$1,862.09)	-0.21	(\$412/ton)
Total	32,574 lbs.			

Obviously, the resale value from the spring Somerville collection distorts the costs from the other three events. When planning a similar event, the possibility of a significant positive impact from resale items should not be a line item, but should be an opportunity that is seized if it occurs.

This report recognizes that the value of resalable items is a variable with great impact and no predictability: The data should be viewed without the positive impact of the resale items so that a baseline or realistic approach be anticipated by any community contemplating an electrical and electronic equipment collection event:

TABLE 5.8 Summary Values WITHOUT Resale:

Collection event	lbs. collected	Revenue (Cost)	Revenue/lb (Cost)/lb	Revenue/ton (Cost)/ton
Somerville Fall 1996	7,448	(\$3,299.36)	-0.44	\$886/ton
Somerville Spring 1997	12,654	(\$2,053.01)	-0.16	\$324/ton
Binghamton Fall 1996	2,372	(\$443.75)	-0.19	\$374/ton
Binghamton Spring 1997	9,031	(\$1,862.09)	-0.21	\$412/ton
Total	31,505 lbs.			

The numbers provided in this report are based on collection rates in a given area at a given time under certain conditions. Next year, the same collections could have a completely different cost/revenue scenario depending on market conditions and costs at that time.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 GENERAL CONCLUSIONS

This residential collection pilot project removed more than sixteen tons of material from municipal solid waste disposal, which may included some toxic constituents such as lead from CRT glass and cadmium from engineering plastics, as well as some other potentially toxic substances such as pigments, stabilizers or fire retardants from engineering plastics. The collections also captured both nickel cadmium and alkaline batteries from various appliances and chlorofluorocarbons from air conditioners. The pilot recycled metals, plastics and other constituents and returned them to productive use.

The economic data from this pilot program suggest that the costs of recovering household electrical and electronic equipment from the municipal/small business waste stream exceeded the costs of handling those wastes as trash in most jurisdictions, it is important to remember that the values provided in this report are based on pilot collection rates in a given area at a given time under specific marketing conditions. Similar collections could have a completely different cost/revenue structure depending on collection volumes and value, proximity to demanufacturing businesses, proximity to markets, current market conditions and vendor costs.

Historically, diverting any commodity from the municipal waste stream has not become economical until a recovery, reuse/recycling infrastructure has developed for that commodity or group of commodities. Both public participation and weight of recovered materials increased in both pilot communities during the second collection event, indicating a positive public response to this new recycling opportunity. Participation rates generally tracked participation rates in the communities' other experiences in collecting new commodities as part of the recycling programs including Binghamton's text book collection efforts and Somerville's household hazardous waste collections.

The general response from the residents was positive and consequently both Binghamton and Somerville are including some type of end-of-life electrical and electronic collection in their 1998 solid waste planning. Based on the lessons learned here, each community plans on modifying the collection model and strategy to collect this material more efficiently. In addition, Envirocycle will be marketing this type of service to municipalities and is willing to work directly with municipalities to design and develop collection programs for communities.

6.2 IMPROVING THE ECONOMICS

This pilot project was designed utilizing the one day collection event model typical for the collection of household hazardous waste. This pilot demonstrated that many variables impact the overall economics of the EOL electrical and electronic equipment collection utilizing this model. Based on the results of the pilot, several recommendations emerge for improving the economics of end-of-life electrical and electronic collection and recovery programs including:

- Specifications for end of life electrical and electronic equipment accepted as part of the collection event

The pilot program was designed to collect any and all electrical and electronic equipment, no limits were placed on what residents could bring to the collection event. Based on the objectives of the specific collection event, develop specifications to: segregate equipment for toxicity, utilize existing reuse infrastructure (i.e. swap shops), utilize existing recycling infrastructure (i.e. scrap metal), determine value for shipment for demanufacturing and finally evaluate traditional disposal as municipal solid waste.

Envirocycle noted that *at least five percent* of the incoming appliances contained only scrap metal and did not contain circuit boards. As one way to improve the overall collection economics, the demanufacturer suggested diverting these mostly-metal appliances (air conditioners, old metal vacuum cleaner bodies, etc.) to a scrap metal container or scrap metal pile for eventual metal recycling. Under favorable marketing conditions, scrap metal recycling generates revenues. However, unless the collection site is already equipped to collect scrap metal and personnel are trained in proper

handling procedures adopting this strategy will involve more planning, more space and increased training. For instance, Federal law requires that CFC-containing appliances (air conditioners, dehumidifiers) have their CFCs removed before the appliance can be recycled; some states also have stringent regulations concerning disposition of appliances containing PCB capacitors.

In fact, Envirocycle suggests diverting any appliance not containing a circuit board to alternative disposition. The high percentage of very low-value materials (without circuit boards) suggests that developing a much tighter collection specification designed to pull in only those items (computers, printers, etc.) that have relatively high value to demanufacturers. Tightening the spec would require a more intense program of public education prior to the first collection day, as well as increased training for the employees or volunteers unloading vehicles at the site.

In reviewing the collection process, Envirocycle now recommends establishing three categories:

1. large items such as TVs, monitors, computers that would be stacked on pallets
2. smaller items such as key boards, VCRs, that would be collected in gaylords
3. items with potential for re-sale as part of the demanufacturing hierarchy would be segregated
4. all remaining items would be sorted for donation or disposal as municipal solid waste.

By aggressively segregating materials, it is expected that the cost of demanufacturing electrical and electronic equipment will decrease, the value of demanufactured materials will increase with the potential to create a more favorable economic scenario.

- Charitable donation or reuse

The pilots as designed sent all electrical and electronic equipment collected to a demanufacturer for evaluation. However, the pilot survey indicated that approximately 30% of the equipment collected were still in working order. Both municipal Somerville's and Binghamton's program coordinators said they would divert *working* electrical and electronic items to repair shops or make them available for direct reuse in the community. Binghamton, for instance, would have donated working razors, toasters, radios TVs and other equipment to the local YMCA, which operates a residence for low-income men; the Broome County coordinator suggested setting up a "testing station" with an active electric outlet for testing appliances at the vehicle unloading zone.

Many municipal recycling drop-off centers have already established "swap shops" or swap area where people pick up useful items others have dropped off. Project coordinators suggested a set-aside area that would allow participants in the collection

drop off to check out, test and take home a working equipment someone else had discarded. The Broome County coordinator suggested having a lawyer draw up a simple waiver for people to sign, signifying that the entity hosting the collection day makes no guarantees and assumes no responsibility for the condition, workability or safety of the used equipment being received.

By segregating materials that may not have value to undergo the demanufacturing process, but still operate again fits into the traditional solid waste hierarchy of reduce, reuse and recycle. This equipment will also be diverted from municipal solid waste disposal at this time.

- **Transportation from the collection site to the demanufacturing facility**

As noted in the economic analysis, the costs associated with transportation vary widely depending on the distance to the actual demanufacturing facility from the collection site. The cost per truckload of material from the Binghamton collection site to the demanufacturing facility was \$96.25 versus the cost per truckload of material from the Somerville collection site to the demanufacturing facility was \$645.84. The transportation cost item alone can greatly impact the economics of conducting this type of municipal collections.

The lesson learned here is to maximize the amount of material that can be transported at one time, in other words ensure that the truck travels completely full. Somerville is evaluating the potential for storage of collected equipment to minimize transportation costs. Also, the efficient sorting of materials may increase the value of what will be ultimately be sent for demanufacturing. Finally, the location and distance to the demanufacturing facility is critical.

- **Location and accessibility of the collection site**

The collection events were held in locations that each community was familiar with and that had hosted collections of other commodities in the past. The Somerville site was at the DPW garage area which also provides residents the opportunity to recycle tires, household hazardous waste, news papers at other collection events. The Binghamton site was the local transit garage which in the past hosted text book collections and tire collections.

The accessibility of the site can be an issue and may impact the collection event. For example, during the fall Binghamton event, bridge construction closed a major route to the bus garage and is suspected in discouraging participation in the collection event.

The pilot results showed that the relatively small size of most equipment and the three-to-five unit contribution per participant may make household electronics good

candidates for seasonal curbside collections. One concern is to limit the removal of the items left at the curbside by unauthorized people. At the very least, this removal may eliminate the items with the highest potential value to the host community but would also eliminate the solid waste burden.

- Labor costs for the collection event

The pilot provided very limited funds for labor associated with the actual collection event. The recycling coordinators for both Somerville and Binghamton were not compensated above their traditional salary for planning and implementing the collection events. Envirocycle provided in kind support to the project for transportation and demanufacturing labor, but these labor costs are evaluated in the economic analysis.

The collection events were largely staffed by volunteers. The volunteers were from the existing town Recycling Committees as well as local universities. The obvious lesson that can be drawn is the more volunteer labor as part of the collection event the lower the costs of collection.

- Community participation

Community participation is paramount to conduct a successful collection event. The assumption being that the more material that is collected, the better chance of collecting more valuable materials. In addition, less materials are going to for disposal and consequently the local recycling rate will also increase. The pilot outreached primarily to residents, but there is clear opportunity to reach out to the small business community, local universities, and other institutions as well.

The pilot results indicated that vast majority of residents, ranging from 57%-88%, participated in the collection event as a result of the direct mail flyer. Direct mail flyers were sent to every household in the community approximately three weeks prior to the event. The Media coverage was sited as the next effective method of communication ranging from 8% to 34%.

All workgroup members agreed that special waste diversion programs work most effectively if they are incorporated into a community's solid waste management planning as ongoing programs, rather than one-time events. A lot of effort and expense goes into event promotion and public education; once you've set up public expectation, it is difficult (and politically inexpedient) to shut it off, and harder still to re-invigorate a collection effort that's been tried and abandoned.

The program planners also agreed that participation in collection programs would increase markedly if the collections were held in conjunction with household hazardous

waste collections or other special recycling collection events (textiles, bulky wastes, scrap metal collections). Conversely, events that can negatively impact participation rates include weather, competing community-wide events and lack of public education.

- **Willingness to Pay**

The pilot tested the willingness to pay argument in the fall Binghamton Collection. In addition, in both the spring Somerville and Binghamton collection events the survey question "To help offset the cost of collection and recycling, would you be willing to pay to drop off your electronics?" The fall Binghamton collection charge \$2.00 per car for the collection event. The event was poorly attended, but potentially for a variety of reasons beyond the willingness to pay issue. Severe weather, bridge construction at the collection location, a local high-school football championship also are believed to have impacted participation. It should be noted that Binghamton city residents are typically charged for disposal of household hazardous waste and tire collection events. Somerville is prohibited by city ordinance to charge for any type of recycling or solid waste collection. The spring survey results show that well over half of the participants were willing to pay for collection. The lesson learned is that each community needs to assess this issue based on specific needs and past practices.

6.3 RECOMMENDATIONS

The pilots conducted as part of this project followed on the traditional one day collection household hazardous waste collection model utilizing a electronics demanufacturer for recycling and disposal. The results argue for improvements to the model to enhance the economic viability of conducting end-of-life electrical and electronic collections in municipalities. Both Somerville and Binghamton will be continuing end-of-life collections in their 1998 solid waste program and will be modifying the collection model to better fit their specific communities needs. For example, Somerville is evaluating conducting monthly collections in conjunction with the household hazardous waste collection days and storage of the material until a "truck load" is accumulated to optimize transportation costs. Binghamton is evaluating working with local charities and not for profits to define what equipment will go to a demanufacturer or a local charity. Every community is somewhat unique and should design a program that is applicable to specific needs.

However, there are other collection models that may be applied to end-of-life electrical and electronic equipment that were not specifically evaluated as part of this pilot. One collection method is partnering with local business. In local areas where large businesses and industries already may be recycling electronic equipment, municipal solid waste officials may want to consider partnering with one or more commercial entities in organizing a municipal collection event. In exchange for public recognition, the commercial operation(s) could provide services ranging from technical or financial

support to storage or loading equipment, a licensed collection or aggregation site, access to reliable vendors - or even serve as an intermediate vendor itself, transporting the collected equipment from the municipal site to a demanufacturing facility.

A second collection method is partnering with existing not-for-profits. In many parts of the nation, non-profit organizations have developed an infrastructure for reuse or resale of computers and other electronic office equipment. Some of these organizations provide vocational training or job development for handicapped citizens; other enterprises were developed to ensure that under-served schools and other not-for-profit entities. To learn how to tap into this reuse network, contact your state's environmental regulatory agency, state recycling coordinator or state nonprofit recycling organization for information.

Finally, there are infinite collection, reuse, demanufacturing and recycling scenarios that may be applicable to a specific municipality. This report makes not attempt at evaluating every type of scenario, but simply presents the results of pilot collections modeled after the traditional one day household hazardous waste collection days. The CSI workgroup is sponsoring additional research into collection methodologies and will publish its findings in the summer of 1998.

Appendix 1
CSI Involvement and Development



The Common Sense Initiative

An Industry Sector Approach for Protecting the Environment

Support for environmental protection has never been stronger in this country. American citizens demonstrate concern and support for the environment. But living in an ever more complicated world and an increasingly global economy has demanded new ways of protecting the environment -- ways that not only protect and enhance environmental health for future generations, but that also keep our economy growing.

One way the Environmental Protection Agency (EPA) is striking this balance is through the Common Sense Initiative, or CSI. CSI represents a new approach for EPA in creating policies and environmental management solutions that relate to industry sectors.

Six Industry Sectors

CSI examines the environmental requirements impacting six industries:

Automobile Manufacturing
Computers and Electronics

Iron and Steel
Printing

Metal Finishing
Petroleum Refining

These six industries:

- comprise over 11% of the U.S. Gross National Product;
- employ over 4 million people; and
- account for over 12% of the toxic releases reported by American industry.

As such, they offer excellent opportunities to test and refine CSI concepts, to create environmental solutions that can operate across industries, and to expand CSI to other relevant sectors.

How CSI Works

For each industry, known as a "sector" in the CSI program, EPA convenes a team of stakeholders that look for opportunities to change complicated and inconsistent environmental policies into comprehensive sector environmental strategies for the future. The process, while sometimes lengthy, is producing better, more applicable environmental protection strategies that are developed by those who have to live with them -- avoiding costly and time consuming adversarial processes later.

Sector teams and work groups meet frequently to discuss progress in the various projects underway, policy considerations, and other issues. Team decisions, issues and data are forwarded to the CSI Council, comprised of high-level decisionmakers from all the stakeholder groups and across all involved industries.

The CSI Approach

From Conflict...

While America has much to be proud of over the past 25 years, we are left with difficult problems - an unwieldy system of laws and regulations that often breeds conflict and gridlock, and an adversarial relationship between the concepts of a cleaner environment and a healthy economy. EPA operates under 16 major national environmental laws overseen by over 70 Congressional committees and subcommittees. EPA is subject to over 600 lawsuits at any given time. Much of EPA's work is a result of court-orders and court-directed activities. Such a process often diverts valuable resources from the real work of protecting the environment and public health to the work of litigation.

From Piece-meal...

The first 25 years of environmental regulation in the U.S. addressed air, water and land separately, frequently shifting and shuffling pollution without preventing it. U.S. businesses spent close to \$30 billion on environmental compliance in 1992, but still released over three billion pounds of toxic emissions. The result has been too little environmental protection at too high of cost. Rather than treating industries as a whole, with unique issues and solutions, the system lumped all industry together and attempted to force one-size-fits-all solutions. These solutions are often costly for industry and not necessarily the

To Consensus...

CSI is an experimental effort to change the environmental protection process from one of conflict to one of collaboration and consensus. For each industry, CSI brings together a team of representatives of: industry; environmental groups; community groups; environmental justice groups; labor; and, Federal, state, local, and tribal governments. These teams craft solutions to environmental problems that all can agree to, harnessing the expertise of those who have worked on these issues for years. Former adversaries become partners in protecting the environment. Time is spent up front in the development of solutions, rather than later on litigation.

To Holistic...

CSI addresses environmental protection in a holistic way, looking at air, water, and land issues as a whole, rather than as separate problems -- avoiding the problem of shifting pollution between media -- from air to water, air to land, or land to water. CSI views industries as unique entities with unique problems -- problems which can best be solved by those individuals familiar with the industry and its processes. Solutions that work for the auto industry may not necessarily make sense for the computers and electronics industry. CSI recognizes this and develops solutions on an industry-by-industry basis.



United States Environmental Protection Agency

**THE COMMON
SENSE INITIATIVE:**

*A New Generation
of Environmental
Protection*

**CSI Computers &
Electronics
Sector**

**Computers & Electronics
Quick Reference:**

Membership

Projects

Contacts

Meeting Minutes

**Computers &
Electronics
Industry Background**

Industries in the computers and electronic sector manufacture an extensive range of products--computers, fax machines, televisions, and CD players to name a few--including the electronic components, such as semiconductors and printed wiring boards, that are a part of those products. The computers and electronics sector is one of the largest employers in the United States. Although industry manufacturing facilities are located nationwide, approximately 60 percent are concentrated in six states--California, Texas, Massachusetts, New York, Illinois, and Pennsylvania.

**The CSI Computers
& Electronics
Subcommittee**

The Computers and Electronics Sector Subcommittee has about 25 members representing such organizations as the New Mexico Environmental Law Center, Intel, Continental Circuits, the Communications Workers of America, the state of Washington, and the Coalition of Hispanic Health and Human Services Organizations. Members meet about six times a year to review the progress of work group projects, to act on recommendations submitted by the work groups, and to hear panel discussions or special presentations on subjects related to the industry.

**Electronic Product
Recovery
and Recycling
Residential
Collection Pilots**

In this world of rapidly changing technology, disposal of computers and other electronic equipment has created a new and growing waste stream. The Computers and Electronics sector has embarked on a project designed to 1) determine the composition of the waste stream, and the types and volume of equipment to be collected; 2) assess the economic viability of a residential post-consumer collection/de-manufacturing program for end-of-life electronic equipment; 3) determine residents' willingness to pay for this disposal option; and 4) evaluate any available data on other residential post-consumer pilot collection programs.

**Project Contact: Chris
Beling U.S. EPA
617-565-3241**

Two pilot communities have been identified--Somerville, Massachusetts, and Binghamton/Broome County, New York. One collection was completed in the fall of 1996 and an analysis of the types of products recovered is underway. A second collection day is planned for 1997.

**RCRA Regulatory
Barriers to
Cathode Ray Tube
(CRT)
Recycling**

Project Contact:
Charlotte Mooney
U.S. EPA
703-308-7025

Computers and televisions use a Cathode Ray Tube (CRT) for viewing. The CRT contains lead to shield users from the radioactivity required to produce the image. Improper disposal of CRTs can place lead in the waste stream which represents not only a health hazard, but also the loss of a recyclable natural resource. Lead recovered from used CRTs can be safely, and practically reused to produce new CRTs.

A work group is developing a strategy for removing perceived federal regulatory barriers to recycling CRTs. Its goal is to apply common sense to hazardous waste requirements for this waste stream while maintaining high standards for health concerns. The strategy will take into account potential economic benefits, as well as potential risks to the environment, the community, and workers. The project team will document the basics of CRT recycling; existing federal regulatory issues relating to CRT recycling; environmental and worker safety risks posed by CRT recycling methods; and the economic and environmental benefit and risk issues of CRT recycling. Upon completion of this work, options for improving the current system will be presented to the Computers and Electronics Subcommittee and the CSI Council.

**Electronic Product
Recovery
and Recycling (EPR2)
Conference and
Roundtable**

Project Contact:
John Alter
U.S. EPA
202-260-4315

Education, information exchange, and building productive relationships among diverse stakeholders concerned with managing out-moded computer equipment are the goals for this project. The workgroup co-sponsored a very successful conference on electronic product recovery and recycling held in February 1997 and attended by over 200 people. The conference was the kick-off for an independent Roundtable being established to facilitate sound management of end-of-life electronic equipment over the long term. The Roundtable will identify and promote resolution of emerging issues related to better management of unwanted computer equipment. CSI's partner for carrying out the initial phases of this project is the Environmental Health Center, a division of the National Safety Council.

**Barriers to
Closed-loop
Water Recycling
in the Electronics
Industry**

Project Contact:
Jan Goodwin
U.S. EPA
202-260-7152

Electronics manufacturing facilities produce a considerable amount of waste water during production. Some facilities would like to treat waste water on-site and recycle it back into production (closed-loop recycling). While no release of waste water is desirable, there are associated environmental and regulatory issues that must be addressed.

This project team will address federal regulatory barriers in the Resource Conservation and Recovery Act (RCRA) that inhibit closed-loop recycling. Major activities underway are: 1) identifying examples in states with electronics manufacturing facilities that use closed-loop treatment and recycle systems; 2) characterize the technology used; 3) identify any potential media transfers of pollutants; 4) determine regulatory position of state agencies; and 5) examine the applicability of existing RCRA exemptions/exclusions to the system. A final recommendation may be made to the CSI Council regarding alternatives to current environmental policy that would enhance utilization of this system and increase opportunities for pollution prevention.

**Reporting and
Public Access to
Information**

Project Contacts:
Warren K. Beer
U.S. EPA
415-744-1803

Mary F. Dominiak
U.S. EPA
202-260-7768

Texas
Consolidated
Uniform Report
for the
Environment
(CURE)
Project Contact:
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Basic On-Line
Disaster and
Emergency
Response
(BOLDER)

Project Contact:
Warren K. Beer
U.S. EPA
415-744-1803

Industry faces multiple environmental reporting requirements. With care and analysis, these requirements may be consolidated to reduce the reporting burden on an industry, while at the same time improving environmental, health, and safety protection.

The Computers and Electronics sector identified a mutual interest among stakeholders to reinvent environmental reporting. The Reporting and Public Access Information Work group initiated two projects designed to streamline and consolidate environmental reporting in the industry while simultaneously improving public access to information on the industry's environmental performance. These two pilot projects are the Consolidated Uniform Report for the Environment (CURE) project in Texas and the Basic On-Line Disaster and Emergency Response (BOLDER) system in Arizona (see below).

The Texas Natural Resources Conservation Commission (TNRCC) has been working to streamline and consolidate all environmental reporting requirements into one Consolidated Uniform Report for the Environment (CURE). Within the guidelines of CSI, TNRCC expanded their stakeholder involvement and included an assessment of stakeholder information needs. As a result, the CURE will pilot a new electronic reporting system based on the information each stakeholder group needs in order to make sound environmental decisions. This system will also improve public access to the information. The Texas CURE pilot will provide guidance for similar efforts in other states.

This pilot has several objectives aimed at consolidating emergency response plans where possible. Goals include eliminating duplicative reporting, making the reports easier to access and to understand, and to enable on-line reporting and information retrieval.

The state of Arizona has agreed to pilot this program, and it is being managed by U.S. EPA's Region 9. The pilot will test a comprehensive emergency response system which is 1) needs-based, 2) electronically-linked, 3) tiered, 4) simplified, and 5) coordinated with industry, community, the public, emergency response agencies, and NGOs. A draft reporting system was designed in 1996. Pilot testing of the electronic reporting and retrieval system is targeted for early 1998.

**Alternative System of
Environmental
Protection**

Project Contact:
David B. Jones
U.S. EPA
415-744-2266

This project will recommend an alternative approach to environmental protection. Key elements of the approach are that it increases regulatory flexibility, results in enhanced environmental, health, and safety performance, and boosts participation of community and workers.

The subcommittee reached consensus on and presented to the CSI Council a document entitled, "Facility-Based Alternative System of Environmental Protection." The document describes the vision, goals, objectives, and conceptual components of an alternative system. The Computer and Electronics Sector will use the document to direct and test alternative strategies to the existing system. The Alternative System of Environmental Protection will be piloted under this work group's direction. Pilot proposals are being solicited from industry, government, and communities.

**Calendar
of Events**

Subcommittee meetings for 1997 are currently being scheduled. For information contact John Bowser at 202-260-1771 or Dave Jones at 415-744-2266.

**The Common
Sense Initiative**

The Common Sense Initiative is an innovative approach to environmental protection and pollution prevention developed by the U.S. EPA. The Initiative addresses environmental management by industrial sector rather than by environmental medium (air, water, land). EPA selected six industries to serve as CSI pilots: automobile manufacturing, computer and electronics, iron and steel, metal finishing, petroleum refining, and printing. Six sector subcommittees, each consisting of representatives from industry, environmental justice organizations, labor organizations, environmental organization, the U.S. EPA and state and local governments, address environmental issues facing these industries.

Since beginning their work in January 1995, the sector subcommittees have initiated nearly 40 projects involving more than 150 stakeholders who actively participate in sector subcommittees and subcommittee workgroups. Using a consensus approach to decision making, the groups address diverse topics such as pollution prevention, environmental reporting requirements, and public access to environmental information.

For more information about CSI, call 202-260-7417, contact our web site at <http://www.epa.gov/commonsense>, or write U.S. EPA, MC 6101, 401 M Street SW, Washington, D.C. 20460.

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May 1997**

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Co-Chair Felicia Marcus
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Appendix 2
Detailed Workplan For Pilot Project

4-15-1996

Scope of Work-Pilot Consumer/Community Residential Collection of
End-of-Life Electronic Equipment

BACKGROUND

Currently, the majority of End-of-Life Electronic Equipment Demanufacturing and Recycling projects are focussing on the commercial and business waste streams. This pilot would focus on the residential post-consumer waste stream by assessing the viability of a collection, demanufacturing and recycling program for residential post-consumer electronic equipment.

GOAL

Design and implement a residential post-consumer collection pilot to determine:

- (1) the types and volume of end-of-life electronic equipment that will be collected,
- (2) the economic viability of collecting, transporting, and demanufacturing and recycling end-of-life electronic equipment
- (3) the residential consumers willingness to pay for this disposal option.

TASKS

- 1: Act as a project manager for the design and implementation of the Sommerville, and Binghampton Residential End-of-Life collection pilot in conjunction with the CSI Collection Pilot Project Workgroup (Workgroup). The Workgroup includes, working with EPA project team, Christine Bonica and Chris Beling, and Greg Voorhees/Envirocycle, Patty Dillon/Tufts University, Richard King/Panasonic, Rob /ATT. Participate in at least bi-weekly conference calls with the Workgroup and more frequent communication with the EPA project team. The lead for the project team in Christine Bonica.

****The following is without the additional research that EPA will be conducting over the next two weeks--and consequently will most likely change****

- 2: Work with Workgroup and selected communities/recycling coordinators to design residential post-consumer collection scenarios. Potential ideas for collection scenarios include establishing a special collection day system (similar to household hazardous waste days), drop off centers, or other events. The goal is to tag on to existing events that the communities sponsor
- 3: Work with communities to design an education and outreach program.

- 4: Work with communities to design logistics for collection, storage of collected materials. Coordinate with Envirocycle to arrange transportation to a their demanufacturing-recycling facility.
- 5: Work with Workgroup to design the data collection and analysis effort.
- 3: Select at least two pilot communities to supply a residential end-of-life electronic equipment waste stream. Target two similar communities, potentially suburban communities with existing curbside collection of both recyclables and trash. Phase the pilot to conduct approximately two collection events in each community. One community would be assessed a fee for collection (both pilot events) and the other community would be offered the service free of charge.
- 5: Implement the first residential collection pilot as an onsite coordinator/facilitator. Collect and warehouse end-of-life electronic equipment.
- 6: Provide onsite presence at all collection events. Sort and analyze end-of-life equipment collected based on task 5. Collect data on type, volume, weight, etc.... The data will be incorporated into the final project report.
- 7: Draft final report. Incorporate Envirocycle's analysis of costs of recycling, materials recycled into report format (we need to work with Envirocycle closely to determine what data they will be providing).

RESOURCES

To be determined.

SCHEDULE

To be determined...pending funding and Christine's research.

PRODUCT

NRRA will draft a research report to:

- (1) evaluate the composition of residential/post-consumer end-of-life electronic equipment that is collected,
- (2) present Envirocycle's data
- (3) present and/or reference any other data related to other residential/post-consumer pilot collections efforts.

Appendix 3

Information On Binghamton and Somerville Recycling

SURVEY OF SOMERVILLE, MA AND BINGHAMTON, NY SOLID WASTE PROGRAMS

- 1) What type of recycling program do you have?
- curbside (is there a special fee for large bulky items)
 - drop-off
 - swap shop/exchange area
 - other (i.e., option for paid curbside collection vs. free drop off)
 - where do you physically do the collection

Somerville, MA	Broome County DSWM
Weekly curbside pick-up, same as trash collection day, for all residents and small businesses. Large apartment buildings and business are limited to 8 bins.	Weekly curbside pick-up of recyclables on regular garbage collection days, for all residents and small businesses. Large apartment buildings and businesses contract with private haulers. Collection is provided by municipal haulers, including the City of Binghamton, Town of Union, and the villages of Endicott and Johnson City; and several private haulers in Broome County.
White goods are collected curbside for no charge and recycled for scrap metal. There is no charge for bulky items.	White goods are collected curbside by the City of Binghamton and recycled for scrap metal. There is no charge for bulky items. Note: special tire collections are held periodically for City residents at no charge, or residents can dispose of tires year-round at the Nanticoke Landfill for \$0.75 per passenger tire.
Drop-off center for all curbside materials, used motor oil, and tires open 7 a.m. to 8 p.m. seven days a week. There is no charge for recyclables, tire, or oil drop-off.	Recycling drop-offs for batteries and recyclables are located throughout Broome County, including the City of Binghamton, Nanticoke Landfill, and Towns of Colesville and Sanford. Automotive fluids are accepted only at the Landfill recycling drop-off (located 10 miles outside of Binghamton)
The only swap/exchange is for paint, occurring at the monthly HHW collection	A limited amount of virgin paints and automotive fluids collected at the HHW collection facility is given out for reuse.

There is no fee for curbside collection of trash or recyclables for residents. Businesses must pay for trash collection by the municipality, but receive free curbside recycling. Drop-off is free for any Somerville resident or business.

In the City of Binghamton, a pay-per-bag fee of \$ 1.17/32-gal bag, \$0.63/16-gal bag and \$0.39/8-gal bag has been in effect since 1991. The bag fee covers the costs of collection of all garbage, bulk items, and recyclables for City residents.

There is no fee for curbside pickup of recycling or materials brought to a County recycling drop-off center.

2) What part of the recycling program is voluntary vs. mandated?

Somerville, MA	Broome County DSWM
All recycling is voluntary.	Recycling is mandated by Broome County Local Law of 1992 requiring all businesses and residents of Broome County to separate recyclables from their waste. The Mandatory Source Separation Law is only enforced through load-inspection at the Nanticoke Landfill, with fines issued to haulers whose waste loads contain a noticeable amount of recyclable material.

3) When did you start the programs?

Somerville, MA	Broome County DSWM
Curbside recycling was brought to half the city in October 1991, and to the entire city in July 1993. Curbside recycling for businesses began on September 1995.	The county recycling program began as a pilot in 1987 and was fully implemented county-wide by 1991. Curbside recycling and the pay-per-bag fee was instituted in the City of Binghamton in January 1990.

4) What materials do you collect?
 - how are they recycled
 - amount recycled/amount disposed of
 - tonnage of recycled materials

Somerville, MA	Broome County DSWM
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<p>clear and colored glass; by-metal cans; empty aerosol cans; aluminum cans, foil, and trays; #1-#7 plastic containers, including styrofoam; milk cartons and drink boxes; newspapers; magazines; junk mail; telephone books; mixed paper; boxboard; corrugated cardboard;</p>	<p>Commingled Containers: glass containers-clear, green and brown; non-aerosol metal including metal cans and lids; aluminum cans, foil and trays; plastic containers numbered 1-7, excluding styrofoam; gable top milk and juice cartons. Mixed paper and Cardboard: all clean paper; boxboard; corrugated cardboard.</p>
<p>Recycled materials are tipped directly at Prins Recycling Center, a Materials Recovery Facility in Charlestown MA. The drivers divide all materials into two streams at the curb; all paper products and other commingled materials.</p>	<p>Residents divide materials into containers (commingled in bins) and paper fibers (placed in paper grocery bags or bundled). Recyclables are collected and brought to Broome Recycling (Materials Recovery Facility) where they are sorted, baled and shipped to market.</p>
<p>The diversion rate for recyclables in Somerville has gone from 5% when curbside was in half the city, to just under 15% for the last few years. Detailed tonnage figures for calendar year 1995 are provided on the Recycling Report Card Data Sheet. Figures for this year are slightly lower than for 1994 because we had a very serious problem with paper scavenging last Spring and Summer when the markets were high (more than 20% of our usual paper tonnage was stolen from the curb over a several month period;</p>	<p>The 1995 recycling rate in Broome County was 50.4% or 120,000 tons in 1995, including all forms of recycling such as curbside collection and drop-offs, leaf and yard waste recycling, scrap metal recycling and sewage sludge composting. The 1995 recycling rate for the City of Binghamton was approximately 48%. Recycling tonnages were 5,000 tons for curbside recycling, 6,100 tons for yardwaste, and 442 tons for scrap metal recycling for a total of 11,542 tons last year.</p>
	<p>Other Recycled Materials: yard waste, appliances and scrap metals are separated for recycling by residents for curbside collection in the City of Binghamton and most of Broome County.</p>

5) Do you have a household hazardous waste collection day(s)?

Somerville, MA	Broome County DSWM
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As of April of 1995, we opened a permanent HHW center, and hold monthly collections from April through November. Annual or bi-annual collections were held for the few years prior to the opening of the permanent center.

In February 1996, Broome County opened a permanent HHW collection facility to service all Broome County residents and exempt small quantity generators. The Facility is located at the Broome County Landfill and is open year-round, three days each month. There is a \$2.00 fee per vehicle for residents and a \$40.00 annual permit fee plus \$0.50 per pound fee for businesses and institutions. Annual or bi-annual collections were held for five years prior to the opening of the Facility.

- 6) Do you have a suitable location for an electronics collection event, including shelter in the event of rain, and temporary storage facility?

Somerville, MA	Broome County DSWM
Yes, the DPW yard is used for our HHW collections. There is ample space within existing truck byas to collect the materials under shelter, and also to store them.	<p>Several options have been discussed fro collection points: the Maatco (Envirocycle) facilities throughout the Tri-Cities area, the Broome County Nanticoke Landfill, and the Broome county Highway Garage.</p> <p>The Highway Garage is most likely the best choicde, due to its location, size, and previous use for HHW collection events. The Facility has 6 drive-through bays, a mile-long access road from Route 12 in the Town of Chenango, is easily accessible from all major routes and is within a 10 mile radius of Binghamton.</p> <p>According to conversation with Envirocycle, storage is not an issue because of their proximity to the Binghamton area.</p>

- 7) What are the current costs for Towns (i.e., collection costs, tipping fees, etc.)?

Somerville, MA	Broome County DSWM
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Our MSW tip fee is \$45.35 per ton, and our MSW collection cost is about \$28/ton. All of our MSW is landfilled at a Waste Management landfill. Our recycling is conducted by DPA workers and is approximately \$70/ton to collect. Currently, we have a contract to receive \$50/ton for paper and \$20/ton for commingled, but this is far beyond current market rates, and will probably have to be modified (the MRF, Prins, is facing bankruptcy).

Current tipping fees at the Broome County Nanticoke Landfill is \$40.00/ton for MSW, down from \$50.10/ton in 1995. All MSW is disposed of in the Broome county Landfill, and all recyclables are brought to the Broome Recycling Facility at no charge.

Scrap metals are taken to scrap yards where the City receives revenues according to current scrap metal market value or approximately \$25.00/ton. Yard waste is taken to a private local composting operation, Hughes Organics, at an annual cost of \$76,000 or approx. \$12.50 per cubic yard.

8) Do you have any other collection opportunities or events?

Somerville, MA	Broome County DSWM
<p>We had a pilot curbside furniture collection program with Mass. Coalition for the Homeless. Residents were instructed to put furniture and household items curbside one day prior to their regular trash collection. This way, unacceptable items could just be picked up with the regular trash on the following day. Participation and interest by residents was good, but most of the material was stolen from curbside. The Homeless Coalition gathered less than one truck load of furniture.</p> <p>Yard wastes are not collected, but we have an active program to encourage backyard composting. High-quality composters are sold for \$25 through a state bulk buying program, and numerous workshops and composter sales are conducted. Nearly 700 units have been sold in the two years the program has been running.</p>	<p>Broome County Division of Solid Waste Management sponsors various collections that service all county residents (including the City of Binghamton). Past events include magazine drop-off days, telephone book collections, and HHW events. Currently, Broome County sponsors textbook collection days, backyard composting workshops and bin distribution and is planning a textile collection in 1996.</p> <p>The City of Binghamton holds periodic drop-off days (usually in the spring) for waste tires, where City residents can dispose of up to 4 tires at no charge.</p>

9) What is the timing of pick-up or special programs, and days of operation?

Somerville, MA	Broome County DSWM
HHW collections are held on the second Saturday of every month from April through November, from 9a.m. to 12p.m. composter sales and workshops are typically held on random Saturdays during similar hours and occasionally on Tuesday or Wednesday evenings from 7p.m. to 9p.m.	Special collections are usually held in the Spring and/or Fall, selected days depend upon the nature of the event, but Saturday collections have been successful for pilot projects.

10) How do you track what you collect?

Somerville, MA	Broome County DSWM
Collection is tracked by weight slips from the recycling MRF and the solid waste transfer station. Our recycling diversion rate is just under 15%. Recycling rate = weight of recyclables divided by w	Collection is tracked from tonnage reports from the MRF and Landfill scalehouses.

11) How would you generally characterize your communities response to recycling and special collection events?

Somerville, MA	Broome County DSWM
Public reaction is generally positive, residents like the programs and are glad to see them in place. There is room for improvement in terms of increasing participation. (This is why we are currently running the Recycling Rewards program).	Broome County, including the city of Binghamton, has a high participation rate in curbside collection programs (about 90%), and a successful participation rate in every collection event held, often greatly exceeding the projected numbers.

12) Do you work with the industrial or commercial (small business) sector in your community?

Somerville, MA	Broome County DSWM
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The bulk of small businesses use the municipal solid waste collection decal system. In addition, about half of the small businesses have joined the curbside collection program.

Since recycling became mandatory in 1992, most businesses in Broome County recycle. On a daily basis, the Broome County Division of Solid Waste Management helps business owners (both small and large), in determining disposal, recycling and waste reduction options. monthly, a task force of industry and large retail store representatives meet to discuss current solid waste issues and tour local recycling and manufacturing processes.

13) What percent of the municipality is commercial? residential?

Somerville, MA	Broome County DSWM
About 10% of the community is commercial and 90% residential by land area. Also, Somerville was at one time the most densely populated city in the U.S. and is currently the most densely populated city in New England and the eight in the U.S.	(By land area: not available at this time) By disposal rates: In a 1995 Broome County Waste Composition study, 51% of the waste disposed of at the Nanticoke Landfill was from residents and 49% of the waste was from commercial, industrial or institutional facilities.

14) How do you educate the community about the recycling program (diversion rate)?

Somerville, MA	Broome County DSWM
There is an article in the local paper around Earth Day. Also, the statewide Recycling Report Card tends to receive a lot of press attention.	Annual recycling statistics are announced at news conference in Spring and/or near Earth Day (April 22). An article in the major local newspaper, The Binghamton Press, usually appears at that time.

15) What special events take place in the community that we would need to avoid?

Somerville, MA	Broome County DSWM
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The DPW is adjacent to a baseball field, so the collection event should not coincide with an important game to avoid traffic issues.

Earth Fest - April (last Sat)
SUNY and BCC Graduations - May (3rd weekend)
High School Graduation - June (3rd weekend)
Downtown Binghamton July Fest - July (3rd weekend)
Balloon Rally and Spiedie Fest - August (1st weekend)
Roberson Museum and Science Center Arts Festival - September (2nd weekend)
Riverbank Clean-up - October (tba - 1st or 2nd weekend)

Additional Notes:

Somerville, MA

Comparing ethnic diversity between the two communities, and educating non-English speakers about the program are issues to be addressed.

Broome County DSWM

English is the dominant language, followed by Spanish (less than 10%), and an array of Eastern European (Russian, Slovak, Bosnian, etc.) and Asian languages (Laotian, Vietnamese, Chinese, etc.). Perhaps the best solution for a brochure, considering the diversity, is to go with English and Spanish.

Binghamton University students make up a significant number of residents who perhaps should be considered in the outreach for and timing of the collections (i.e., moving out or to new apartments in mid-May and early December).

Appendix 4
General Survey

HOUSEHOLD ELECTRONICS COLLECTION DAY
Somerville, Massachusetts
Generator Survey
April 19, 1997

Thank you for coming to this special Somerville, Massachusetts collection day. Your participation and support will help our city and many other cities around the country understand how the recovery of electronic appliances impacts our environment. Please complete both sides of this survey and return to the attendant when they begin to unload your vehicle.

Your reasons for participating in this collection day...

- Recycling protects our environment Agree ____
- Electronics can be kept out of landfills and incinerators Agree ____
- May help reduce cost of solid waste management Agree ____
- How did you hear about today's event? Flyer ____ Media ____ Friend ____ Other ____
- Are you assisting anyone else and dropping off their household electronics today? Yes ____
No ____ If yes, how many additional households? ____

Information on your (check one) Household ____ Apartment ____ Business ____

City _____ Street _____

- Did you participate in the first collection day in the fall? Yes ____ No ____
- If you answered home or apartment, # of people in your home? Adults ____ Children ____
- If you answered business, # of employees at your place of business? ____
- Type of business? Administrative ____ Manufacturing ____ Retail ____ Service ____ Sales ____
Other _____
- To help offset the costs of collection and recycling, would you be willing to pay to drop off your electronics? Yes ____ No ____
If yes, how much per collection day? \$1-5 ____ \$6-10 ____ Greater than \$10 ____

PLEASE COMPLETE THE BACK SIDE OF THIS SURVEY

Binghamton, NY

HOUSEHOLD ELECTRONICS COLLECTION DAY Generator Survey May 10, 1997

Thank you for coming to this special Binghamton, New York collection day. Your participation and support will help our city and many other cities around the country understand how the recovery of electronic appliances impacts our environment. Please complete both sides of this survey and return to the attendant when they begin to unload your vehicle.

Your reasons for participating in this collection day...

- Recycling protects our environment Agree ____
- Electronics can be kept out of landfills and incinerators Agree ____
- May help reduce cost of solid waste management Agree ____
- How did you hear about today's event? Flyer ____ Media ____ Friend ____ Other ____
- Are you assisting anyone else and dropping off their household electronics today?
Yes ____ No ____ If yes, how many additional households? ____

Information on your (check one) Household ____ Apartment ____ Business ____

City _____ Street _____

- Did you participate in the first collection day in the fall? Yes ____ No ____
- If you answered home or apartment, # of people in your home? Adults ____ Children ____
- If you answered business, # of employees at your place of business? ____
- Type of business? Administrative ____ Manufacturing ____ Retail ____ Service ____
Sales ____ Other ____

To help offset the costs of collection and recycling, would you be willing to pay to drop off your electronics? Yes ____ No ____
If yes, how much per collection day? \$1-5 ____ \$6-10 ____ Greater than \$10 ____

PLEASE COMPLETE THE BACK SIDE OF THIS SURVEY

Appendix 5

Manifest

**Receiving Manifest
Somerville, MA
April 19, 1997 Electronics Collection**

Home Video		working	not working	unsure	Over 35"
		Under 15"	16-21"	21-35"	
Table Top TV	B/W or Color				
Floor Model TV	B/W or Color				
VCR					

Audio		working	not working	unsure	over 5 years old
Port. Radio/Tape/CD					
Home Stereo					
Tape Recorder					
Car Audio/Tape					
Speakers					
Electronic Instrument					

Office		working	not working	unsure	over 5 years old
PC / Computer					
Monitor					
Keyboard					
Printer					
Copier					
Fax					

Communication		working	not working	unsure	over 5 years old
Resident Phone					
Business Phone					
Cellular Phone					
Cordless Phone					
2-Way Radio					

Home Appliance		working	not working	unsure	over 5 years old
Microwave Oven					
Air Conditioner					
Vacuum					

Small Counter Top		working	not working	unsure	over 5 years old
Toaster Oven					
Can Opener					
Coffee Maker					
Food Processing					

Other					
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Binghamton, NY

Receiving Manifest Electronics Collection May 10, 1997

Home Video	working	not working	unsure	Over 35"
	Under 15"	16-21"	21-35"	
Table Top TV B/W or Color				
Floor Model TV B/W or Color				
VCR				

Audio	working	not working	unsure	over 5 years old
Port. Radio/Tape/CD				
Home Stereo				
Tape Recorder				
Car Audio/Tape				
Speakers				
Electronic Instrument				

Office	working	not working	unsure	over 5 years old
PC / Computer				
Monitor				
Keyboard				
Printer				
Copier				
Fax				

Communication	working	not working	unsure	over 5 years old
Resident Phone				
Business Phone				
Cellular Phone				
Cordless Phone				
2-Way Radio				
Answering Machine				

Home Appliance	working	not working	unsure	over 5 years old
Microwave Oven				
Air Conditioner				
Vacuum				

Small Counter Top	working	not working	unsure	over 5 years old
Toaster Oven				
Can Opener				
Coffee Maker				
Food Processing				

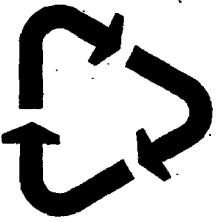
Other				
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Appendix 6

Flyer (sample)

RESIDENTIAL ELECTRONICS RECYCLING PARTNERSHIP

Somerville Residents



US EPA Common City of Somerville
Sense Initiative

Dear Resident,

Somerville is proud to be on the leading edge of another recycling initiative, the Electronic Recycling Project, co-sponsored by the United States Environmental Protection Agency.

The results of this pilot collection will help Somerville and other communities determine the costs and benefits of household electronic recycling. We invite you to be part of this pilot electronics collection.

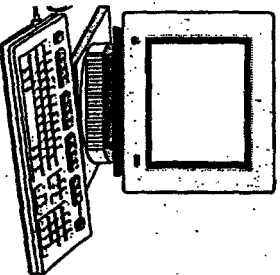
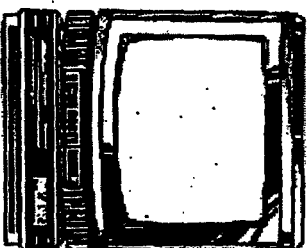
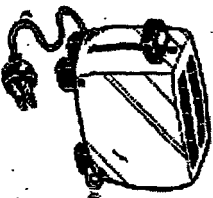
Sincerely,

*Michael E. Capuano
Mayor*

Northeast Resource Recovery Association
P.O. Box 721
Concord, NH 03302-0721

Household and Small Business ELECTRONICS RECYCLING PROJECT

*City of Somerville Environmental Protection Office
The US Environmental Protection Agency
Northeast Resource Recovery Association*



**Saturday, April 19, 1997
9:00 a.m. - 3:00 p.m.**

**City of Somerville
Department of Public Works
1 Franey Road**



Michael E. Capuano, Mayor

NON-PROFIT
ORGANIZATION
PAID
US POSTAGE
CONCORD, NH 03301
PERMIT # 1267

New Recycling Opportunities

Somerville is one of two communities in the nation selected to participate in a Residential Electronic Recycling pilot study. This effort will help establish a national policy on residential electronics recovery and recycling. Our goal is to use information gathered here to assist recycling managers in other communities to develop similar programs.

The electronics recycling pilot project is a unique collaboration among local governments, federal agencies, private manufacturing and recycling industries and non-profit environmental groups. Residents and small businesses in the pilot communities complete the Partnership "loop" by bringing their used appliances to the collection events.

Somerville held its first electronics collection day last November. Please help us complete the pilot project by participating in the second collection.

This project is funded through a grant from the United States Environmental Protection Agency and managed by the Northeast Resource Recovery Association.

Who Can Participate?

- all Somerville residents
- small businesses with fewer than 25 employees
- businesses with more than 25 employees can participate by contacting Envirocycle directly at 800-711-6010 ext. 242 to make special collection arrangements

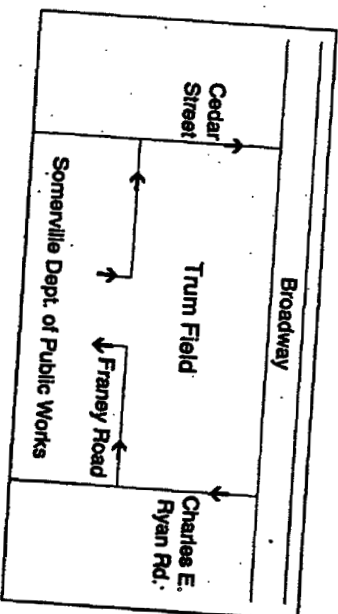
When?

Saturday, April 19, 1997
9:00 a.m. - 3:00 p.m.

What is the cost?

There is no cost to participate.

Where is it?



We have made special arrangements to handle twelve vehicles at a time so you will be through the collection process quickly.

What To Bring

All household or counter-top appliances that are portable or can be plugged in. Examples include:

- computers and printers,
- televisions, VCRs,
- CD players, stereos
- telephones, answering machines,
- air conditioners,
- toasters, coffee makers.

Appliances are acceptable working or not working.

What NOT To Bring

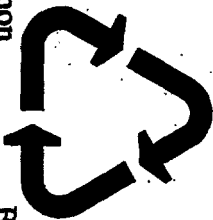
- large or bulky home appliances such as dishwashers, refrigerators, freezers, washing machines, clothes dryers or lawn mowing equipment
- smoke detectors
- x-ray equipment

If you have questions or need more information, please contact:

Hilary Eustace
Environmental Protection Officer
Department of Public Works
City of Somerville
(617) 625-6600 ext. 5070

RESIDENTIAL ELECTRONICS RECYCLING PARTNERSHIP

Broome County Residents



US EPA Common
Sense Initiative

Broome County
Government

Dear Resident,

As part of a national pilot program for electronics recycling, Broome County continues to be at the forefront of solid waste management initiatives.

Like any business venture, evaluating the costs and benefits of a new recycling program is the key to its success. This pilot project will help us determine the future of electronics recycling in Broome County, while serving as a model for the nation.

I invite you to participate in the Electronics Recycling Collection to be held from 9:00 a.m. to 3:00 p.m. on Saturday, May 10, 1997, at the Broome County Transit Garage.

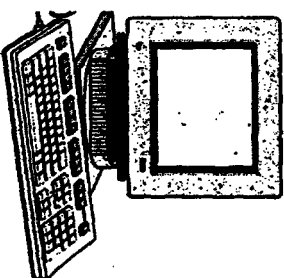
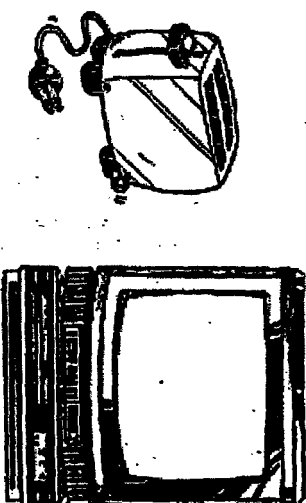
Sincerely,

Jeffrey P. Kraham
Broome County Executive

Northeast Resource Recovery Association
P.O. Box 721
Concord, NH 03302-0721

Household and Small Business ELECTRONICS RECYCLING PROJECT

*Broome County Div. of Solid Waste Management
The US Environmental Protection Agency
Northeast Resource Recovery Association*



**Saturday, May 10, 1997
9:00 a.m. - 3:00 p.m.**

Broome County Transit Garage



Jeffrey P. Kraham, Broome County Executive

NON-PROFIT
ORGANIZATION
US POSTAGE
PAID
CONCORD, NH 03301
PERMIT # 1267

New Recycling Opportunities

Binghamton is one of two communities in the nation selected to participate in a Residential Electronic Recycling pilot study. This effort will help establish a national policy on residential electronics recovery and recycling. Our goal is to use information gathered here to assist recycling managers in other communities to develop similar programs.

The electronics recycling pilot project is a unique collaboration among local governments, federal agencies, private manufacturing and recycling industries and non-profit environmental groups. Residents and small businesses in the pilot communities complete the partnership "loop" by bringing their used appliances to the collection events.

Binghamton held its first electronics collection day last November. Please help us complete the pilot project by participating in the second collection.

This project is funded through a grant from the United States Environmental Protection Agency and managed by the Northeast Resource Recovery Association.

Who Can Participate?

- all Broome County residents
- small businesses with less than 25 employees
- businesses with more than 25 employees can participate by contacting Envirocycle directly at 800-711-6010 ext. 242 to make special collection arrangements

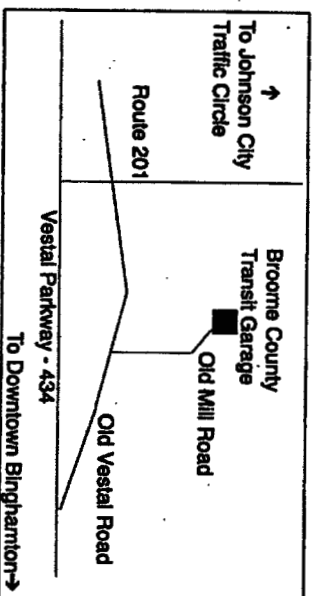
When?

Saturday, May 10, 1997
9:00 a.m. - 3:00 p.m.

What is the cost?

There is no cost to participate.

Where is it?



We have made special arrangements to handle twelve vehicles at a time so you will be through the collection process quickly.

What To Bring

All household or counter-top appliances that are portable or can be plugged in. Examples include:

- computers and printers,
 - televisions, VCRs,
 - CD players, stereos
 - telephones, answering machines,
 - air conditioners,
 - toasters, coffee makers.
- Appliances are acceptable working or not working.*

What NOT To Bring

- large or bulky home appliances such as dishwashers, refrigerators, freezers, washing machines, clothes dryers or lawn mowing equipment
- smoke detectors
- x-ray equipment

If you have any questions or need more information, please contact:

Susan V. Thompson
Solid Waste Management Specialist
Broome County
Div. of Solid Waste Management
(607) 778-2482 or
(607) 778-2932

Appendix 7
Sample Press Releases, etc.



**NORTHEAST RESOURCE
RECOVERY ASSOCIATION**

Post Office Box 721
Concord, NH 03302-0721
(603) 224-6996
Fax (603) 226-4466

"Fostering cooperative solutions"

Dear Somerville Business,

As you will read in the enclosed information, the City of Somerville, the US Environmental Protection Agency and the Northeast Resource Recovery Association are teaming up for a "first in the nation" residential electronics collection and recycling project.

This past week we sent out thousands of flyers to all Somerville residents announcing this special event and asking them to participate on November 2 at the Somerville Public Works Building from 9:00 a.m. - 3:00 p.m.

Today we ask for your help in promoting electronics recycling and this unique collection day event. We have provided you with extra flyers for you to distribute to your clients and two large signs that we ask you to place in your most visible business locations.

Should you have any questions on this event or how you can participate, please contact Hilary Eustace, Somerville Recycling, 617-625-6600 x 5070.

Thank you for your help,

Northeast Resource Recovery Association
City of Somerville
US Environmental Protection Agency

COUNTY OF BROOME
TIMOTHY M. GRIPPEN
COUNTY EXECUTIVE
GOVERNMENT PLAZA, P.O. BOX 1766
BINGHAMTON, NEW YORK 13902

(607) 778-2109

Release:

Immediately - Wednesday, October 9, 1996

Contact:

John Kowalchyk or Susan Thompson
Broome County Division of Solid Waste Management
778-2250 or 778-2932

BINGHAMTON AREA CHOSEN FOR NATIONAL RECYCLING PILOT

County Executive Timothy M. Grippen joined John Matthews, Vice-President of Envirocycle, Inc., and John Kowalchyk, Division of Solid Waste Management Director, to announce the first full-scale *Electronics Recycling Collection* in the nation.

"Broome County is proud to be on the leading edge of another recycling initiative -- the Electronics Recycling Project. Our successful recycling program is one of the reasons this area was chosen to host this pilot collection. Additionally, we are pleased that a local company, Envirocycle of Hallstead, PA, will be processing the items brought for recycling," Mr. Grippen announced.

John Matthews of Envirocycle, Inc. explained the types of items that can be brought to the collection, and how the company processes the materials into their individual components for recycling.

Kowalchyk explained that the residents of this area have consistently shown support for new programs, as demonstrated by participation in the pilot magazine and telephone book collections, household hazardous waste collections and expanded curbside recycling programs. The information gained from these pilot projects allows the Division to assess the feasibility of implementing permanent programs.

The electronic project is cosponsored by U.S. Environmental Protection Agency through the EPA's Common Sense Initiative program, a study group linking industry, policy makers, and environmental groups. The Binghamton area and Somerville, Massachusetts were selected to host the pilot collections. The results of this pilot program will help Broome County and communities throughout the nation determine the costs and benefits of household electronics recycling.

The collection event will be held on Saturday, November 9, 1996 from 9 a.m. - 3 p.m. at the Broome County Transit Garage on Old Mill Road (off Old Vestal Road) in Vestal.

Broome County Electronics Recycling Pilot Collection
Saturday, November 9, 1996
9:00 a.m. - 3:00 p.m.

Who Can Participate:

All Broome County Residents and Small Businesses of less than 25 employees. (Larger businesses and institutions can contact Envirocycle directly at 1-800-~~24~~-6010 ext. 242)

7/1

Where to Go:

The Broome County Transit Garage on Old Mill Road (off Old Vestal Road near the 201 Bridge) in Vestal. Please note: afternoon hours are typically less busy and carpooling is encouraged to reduce traffic volume.

What is the Cost:

There is a \$2.00 participation fee per vehicle. Vehicles should be no larger than typical residential cars and trucks. The fees collected will be used for local recycling education programs.

What to Bring:

All home appliances that are portable or can be plugged in, including home video, audio, office, communication, and countertop appliances.

What Not to Bring:

Large or bulky appliance such as refrigerators, freezers, washers, dryers, or lawn mowers. No smoke detectors, x-ray equipment, or hazardous wastes.

***For More Information
or to Volunteer:***

Contact Susan Thompson at (607) 778-2932.

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SVT: 10/4/96

BROOME COUNTY NEWS RELEASE

JEFFREY P. KRAHAM, County Executive

To: News Department
From: Susan Thompson, 778-2932
Date: Wednesday, April 30, 1997
Sub: **BC ELECTRONICS RECYCLING COLLECTION,
SATURDAY, MAY 10, 1997**

County Executive Jeffrey Kraham joined the Division of Solid Waste Management to announce the *Electronics Recycling Collection* on Saturday, May 10, 1997. The collection will be held from 9 a.m. - 3 p.m. at the Broome County Transit Garage on Old Mill Road (off Old Vestal Road) in Vestal. The event is open to all residents and small businesses (of less than 25 employees) in Broome County. Mr. Kraham explained:

"As part of a national pilot program for electronics recycling, Broome County continues to be at the forefront of solid waste management initiatives.

Like any business venture, evaluating the costs and benefits of a new recycling program is the key to its success. This pilot project will help us determine the future of electronics recycling in Broome County, while serving as a model for the nation."

This is the second of two pilot collections to be held in Broome County. The first was held in November, when over 14,000 lbs of materials were collected from nearly 200 residents and small businesses in the area. The results of this pilot program will help Broome County and communities throughout the nation determine the costs and benefits of household electronics recycling.

The electronic project is cosponsored by U.S. Environmental Protection Agency through the EPA's Common Sense Initiative program, a study group linking industry, policy makers, and environmental groups. The Binghamton area and Somerville, Massachusetts were selected to host the pilot collections.

Envirocycle, Inc. of Hallstead, Pa. will demanufacture and recycle the materials collected. The project is funded through a grant from the USEPA and managed by the Northeast Resource Recovery Association.

**FOR INTERVIEWS OR ON-LOCATION FOOTAGE,
PLEASE CALL SUSAN THOMPSON AT 778-2932**

- page 1 of 2 -

Broome County Electronics Recycling Pilot Collection**Saturday, May 10, 1997****9:00 a.m. - 3:00 p.m.*****Who Can Participate:***

All Broome County residents and small businesses of less than 25 employees. (Larger businesses and institutions can contact Envirocycle directly at 1-800-711-6010 ext. 242)

Where to Go:

The Broome County Transit Garage on Old Mill Road (off Old Vestal Road near the 201 Bridge) in Vestal. Please note: afternoon hours are typically less busy and carpooling is encouraged to reduce traffic volume.

What is the Cost:

There is no fee to participate. Vehicles should be no larger than typical residential cars and trucks.

What to Bring:

All home appliances that are portable or can be plugged in, including home video, audio, office, communication, and countertop appliances.

What Not to Bring:

Large or bulky appliances such as refrigerators, freezers, washers, dryers, or lawn mowers. No smoke detectors, x-ray equipment, or hazardous wastes.

***For More Information
or to Volunteer:***

Contact Susan Thompson at (607) 778-2932.

###

SVT: 4/30/97

Broome to collect old appliances

Electronics recycling day will be Nov. 9

By NADINE SLIMAK
Staff Writer

Can't figure out what to do with the broken microwave oven that's been gathering dust in the garage for two years?

Broome County has the answer.

The county will have its first electronics and appliances collection day Nov. 9. For \$2, Broome residents and businesses with 25 or fewer

employees can get rid of just about anything that plugs in, said John Kowalchuk, director of the county's Solid Waste Management Division.

The effort is one of two electronics recycling pilot programs in the country. The other is in Somerville, Mass.

Most electronics goods are left out with the weekly trash, and end up in the landfill, Kowalchuk said.

The electronics and appliances collected during the project will go to Envirocycle Inc., a company in Hallstead, Pa., which will determine if recycling them is economical or even profitable, said Vice

ELECTRONICS DROPOFF

Broome County's first electronics collection day will be from 9 a.m. to 3 p.m. Nov. 9 at the Broome County Transit Garage on Old Mill Road in Vestal.

For \$2 per car, Broome County residents or businesses with 25 or fewer employees may drop off portable home appliances that can be plugged in,

including countertop appliances. Video and audio equipment will also be collected. The county will not accept large appliances, such as stoves and refrigerators, or smoke detectors, lawn mowers and hazardous wastes. Call the Broome County Division of Solid Waste Management at 778-2932.

President John Matthews.

"Envirocycle will evaluate each item to see if it can be refurbished and resold or if

we can pull the parts and resell them or if we can recycle the

See BROOME/Page 3B

Broome to collect old appliances --

Continued from Page 1B

plastics and metals," Matthews said.

The program will cost the county nothing, said Broome County Executive Timothy M. Grippen. "We're proud to be on the leading edge of electronics recycling," Grippen said during a news conference Wednesday.

The Northeast Resource Recovery Association will collect data from the two pilot programs to determine if it can be cost-effective for municipalities to divert electronics from the household waste stream.

Northeast, a non-profit recycling association based in New Hampshire, received a \$69,000 grant from the U.S. Environmental Protection Agency for the project, said Patrick

Corcoran, member services manager.

If the local company finds the venture profitable, it will likely set up programs with other municipalities such as Rochester or Buffalo, Matthews said.

The collection will be from 9 a.m.

to 3 p.m. Nov. 9 at the Broome County Transit Garage on Old Mill Road in Vestal. The \$2-per-car fee will be used for recycling education programs.

Another collection day is planned for the spring.

10 October 96

Binghamton Press & Sun-Bulletin

Broome County, NY

BROOME COUNTY NEWS RELEASE

JEFFREY P. KRAHAM, County Executive

To: News Department
From: Susan V. Thompson, 778-2932
Date: Monday, May 12, 1997
**Sub: RESULTS OF THE BC ELECTRONICS RECYCLING
COLLECTION, SATURDAY, MAY 10, 1997**

Saturday's collection of electronics and small appliances was over double the size of the 1st pilot collection held last November. Over 15 tons of recyclable materials (31,000 pounds) were collected from approximately 400 households and small businesses in Broome County.

The success of these pilot collections reflects an awareness and a demand for an ongoing electronics recycling program. For these two events, all types of appliances and office equipment were accepted in order to gain knowledge of the costs of recycling a full range of electronic products. Future events may be limited to those products with the greatest recycling benefits, such as:

- * the recovery of valuable metals or readily recyclable materials;
- * elimination of hazardous or toxic constituents; or
- * diversion of significant portions of the waste stream in order to conserve landfill space and increase recycling rates.

This was the second of two pilot collections held in Broome County. The first was held in November 1996, when over 14,000 lbs of materials were collected from nearly 200 residents and small businesses in the area. The results of this pilot program will help Broome County and communities throughout the nation determine the costs and benefits of household electronics recycling.

The electronic project is cosponsored by U.S. Environmental Protection Agency through the EPA's Common Sense Initiative program, a study group linking industry, policy makers, and environmental groups. The Binghamton area and Somerville, Massachusetts were selected to host the pilot collections.

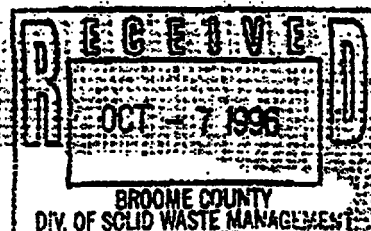
Envirocycle, Inc. of Hallstead, Pa. will demanufacture and recycle the materials collected at the event. The project is funded through a grant from the USEPA and managed by the Northeast Resource Recovery Association.

**FOR INTERVIEWS OR ON-LOCATION FOOTAGE,
PLEASE CALL SUSAN THOMPSON AT 778-2932**

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**NORTHEAST RESOURCE
RECOVERY ASSOCIATION**

Post Office Box 721
Concord, NH 03302-0721
(603) 224-6996
Fax (603) 226-4466



"Fostering cooperative solutions"

Press Advisory

for immediate release

Sept. 4, 1996

contact: Dana Draper

(603) 224-6996

Regional non-profit recycling Association to manage \$69,000 EPA-New England grant

project will collect data on household electronics recycling

CONCORD, NH: The Northeast Resource Recovery Association (NRRA) has received \$69,000 from the US Environmental Protection Agency (EPA) - New England to manage a pilot project that will collect data on household electronics recycling. The project will involve organizing two one-day residential electronics collections in each of the pilot communities of Somerville, Massachusetts and Binghamton, New York.

"This is basically a data collection and analysis project," said NRRA executive director Dana Draper. "Currently, no one has reliable information on just how much electronic equipment generated by households ends up each year in the municipal waste stream. Demanufacturing and recycling facilities have focused almost exclusively on recovering electronic equipment, primarily computers and other office hardware, from the commercial-industrial waste stream.

"Can it be cost-effective for municipalities to collect and bring to market the wide variety of consumer electronic equipment that's still in the municipal waste stream? Will the demanufacturing and electronics recycling industries be able to accommodate the mix of municipally-generated materials? What are the best ways to educate the general public about how to participate in the collection events? How will the costs of household electronics recycling programs be paid? These are a few of the questions we hope this project will answer," said Draper.

The electronics recycling project is one of several being launched around the nation by EPA's Common Sense Initiative (CSI). "The purpose of CSI is to develop and promote cleaner, smarter, cheaper alternatives to meeting compliance with environmental regulations," said Christine Beling, an environmental engineer with EPA-New England.

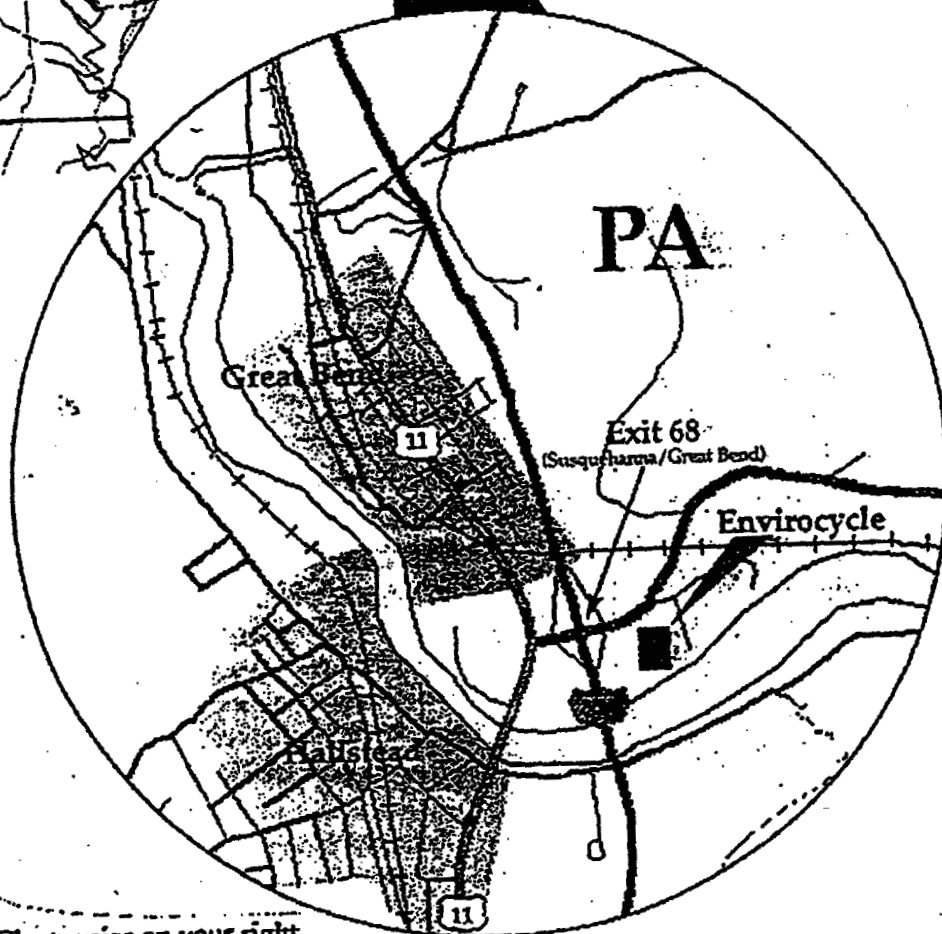
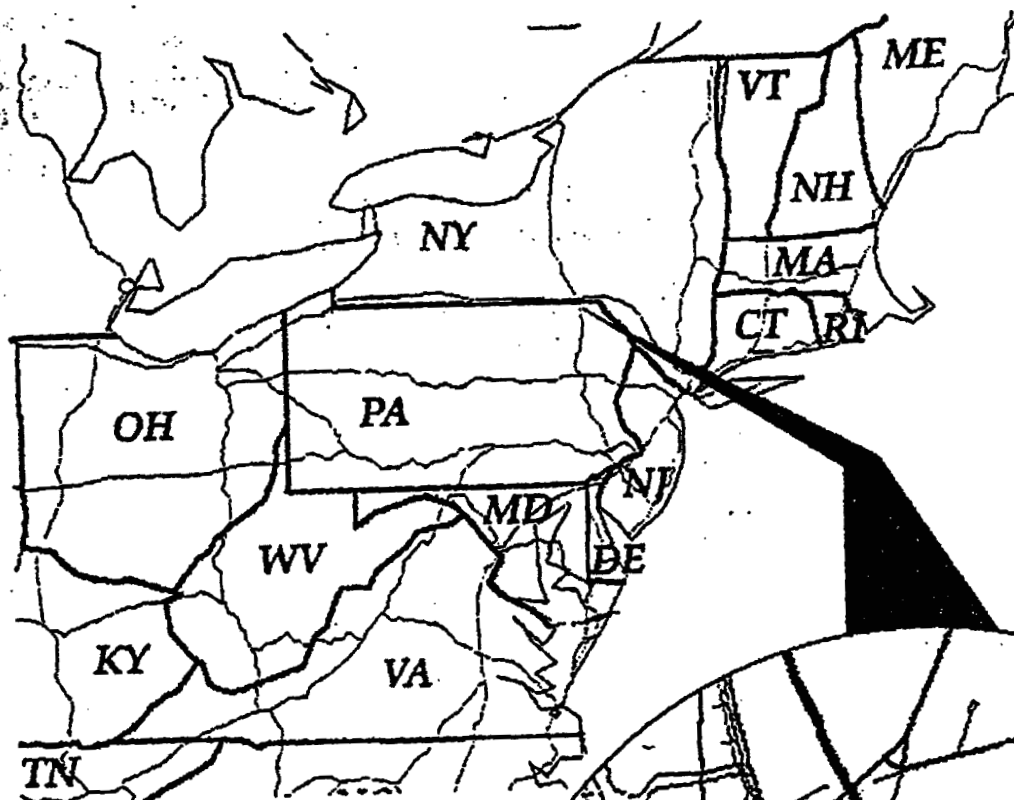
EPA-New England has organized an advisory workgroup to help structure and monitor the electronic equipment collection project. In addition to officials from EPA and Massachusetts and New York state regulatory agencies, the advisory group includes representatives from Tufts University, Panasonic Corporation (an electronics manufacturer) and Envirocycle (an electronics demanufacturing/recycling firm).

"NRRA's 15 years of working closely with municipalities to organize recyclables marketing cooperatives, educate municipal waste managers and help communities educate the general public won the Association the opportunity to manage this project," said Draper. "This cutting-edge project underscores our commitment to helping communities recycle an increasing diversity of materials that are still in the waste stream, filling up landfills."

NRRA is a regional nonprofit membership association that fosters cooperative solutions to common problems managing, reducing and recycling trash. The Association is well known nationally for having pioneered the cooperative model for marketing recyclables, which takes advantage of the collective strength of its membership to negotiate favorable agreements with buyers of recyclable materials.

waste reduction • reuse • recycling • trash management

• printed on recycled paper



- * 81 South.
- * First Exit In PA, Exit 68.
- * At the bottom of the ramp take a left.
- * Go about 100 yards you will see Matco Electronics on your right.
- * Go straight in front of the parking down a little hill.
- * Take the first right this will take you into our parking lot.
- * The door with the awning is the main entrance.

Envirocycle, Inc.
Rt. 81 Exit 68, PO Box 899, Hallstead, PA 18822-0899
Tel: 717/879-2862
Fax: 717/879-2008

Appendix 8
Training Packet

ELECTRONICS COLLECTION PILOT

OPERATIONS OUTLINE

Somerville, MA

11/2/96

The host site facility is the Somerville Public Works Facility. We have been given the use of their parking lot loop, enough room for 12 cars (2 lanes of six cars) to be unloaded at once. There will be internal storage space for any electronics not able to be loaded onto the Envirocycle trucks. In case of rain all volunteers are asked to bring rain-gear and umbrellas. There will be inside break areas established on site.

I. Traffic Flow

It is difficult to predict the participation rate and the resulting vehicle volumes, but we are preparing for a 1% participation from Somerville residents equaling 750 vehicles going through the collection site. Considering the fact that the event will last for 6 hours, we will be prepared to unload 100-125 cars per hour (unfortunately many of these vehicles may arrive in the morning). It is our intent to unload the vehicles in blocks of six when volume permits. When and if vehicle flow is slow we will be able to unload vehicles on an individual basis. See Traffic Flow Diagram attached.

II. Clerical/Data Collection

We have designed two forms to be used during the event day.

• Generator Survey

The first is called the Generator Survey (see attached). This form is two sided and is to be completed by the participating resident. A Generator Survey will be giving to each resident/vehicle as they arrive onto Franey Road (Zone A). They will complete this survey during their waiting period prior to be unloaded in the public works parking area (Zone C) and hand the completed form to the unloading volunteer. This survey will then be stapled to the yet to be completed Receiving Manifest.

- **Receiving Manifest**

This second form is called the Receiving Manifest (see attached). This form is one sided and will be completed only by the unloading volunteers. All recording onto the Receiving Manifest will be done in the public works parking area (Zone C). When completed the Receiving Manifest and the attached Generator Survey will be placed into the designated form box at each unloading station (Zone C).

Any questions on form completion or recording of data will be covered by NRRA staff.

- **III. Volunteers**

We will need a total of 16 volunteers on duty at all times. The breakdown is as follows:

Zone 1 - Distribution of Generator Surveys	2 Volunteers
Zone B - Direct Traffic into Public Works Parking Area	2 Volunteers
Zone C - Unload Vehicles	8 Volunteers
Zone C - Collect and Coordinate Paperwork	2 Volunteers
Zone D - Direct Traffic and Material Movement	2 Volunteers

- Because Somerville will be providing 4-6 paid employees, we will split their paid time between the morning and afternoon. All other volunteers should plan on being there for the full day. So far NRRA will have 4 volunteers (including staff). Patti Dillon, C. Beling, C. Bonica, H. Eustace, R. King, and G. Voorhees also will volunteer. That leaves us needing another 4-6 volunteers from Somerville (not including the paid staff).

A volunteer orientation meeting will be held at 8:00 a.m. the day of the event, November 2. At this meeting Volunteer Packets will be distributed explaining the vehicle flow, the paperwork system and other event details.

- **IV. Refreshments**

NRRA will provide coffee and donuts for all volunteers throughout the day. A pizza lunch and sodas will also be provided for all volunteers.

- **V. Equipment & Supplies**

There are numerous equipment and supply needs for this collection day. In order to make the equipment and supply coordination as simple as possible we have created the following list;

<u>Equipment</u>	<u>Quantity</u>	<u>By When</u>	<u>By Whom</u>	<u>Location</u>
•Forklift	1	11/2	Somerville	open
•Pallet Jacks	2	11/2	Envirocycle	Zone C
•Pallets	125	11/2	Envirocycle	open
•Gaylord Boxes	100	11/2	Envirocycle	open
•Folding Tables	6	11/2	Somerville	Zone C
•Folding Chairs	10	11/2	Somerville	Zone C
•Paperwork Bins	6	11/2	Somerville	Zone C
•Traffic Cones	12	11/2	Somerville	All Zones
•Directional Signs	4	11/2	NRRA	Zone A
•Clip Boards	24	11/2	NRRA	Zone C
•Staplers	6	11/2	NRRA	Zone C
•Pencils	100	11/2	NRRA	Zone C
•Pens	24	11/2	NRRA	Zone C
•Markers	12	11/2	NRRA	Zone C
•Misc. Supplies		11/2	NRRA	Zone C
•Gen. Surveys	1200	11/2	NRRA	Zone C
•Rec. Manifests	1200	11/2	NRRA	Zone C
•Name Tags	50	11/2	NRRA	Zone C
•Coffee Urn	2	11/2	NRRA	Zone C
•Coffee	5 lbs	11/2	NRRA	Zone C
•Sugar...etc		11/2	NRRA	Zone C
•Donuts	4 doz.	11/2	NRRA	Zone C
•Pizza	8	11/2	NRRA	Zone C
•Sodas	2 cases	11/2	NRRA	Zone C
•Coolers	2	11/2	NRRA	Zone C
•Ice	6 bags	11/2	NRRA	Zone C

• VII. Envirocycle

Envirocycle will provide (1) 53' trailer and (1) small box van truck with a lift gate. They will also provide gaylord box labels for each gaylord used in the collection day. Envirocycle will bring the gaylords, the pallets, the forklift and the pallets jacks with them when they arrive at 5:00 p.m. 11/1.

ELECTRONICS COLLECTION PILOT

OPERATIONS OUTLINE BINGHAMTON, NY 11/9/96

The host site facility is the Broome County Transit Garage. We have been given the use of three-four inside bays, enough room for 12 cars (2 lanes of six cars) to be unloaded at once. The internal unloading space is adequate for; material separation, traffic flow, clerical support and weather protection.

I. Traffic Flow

It is difficult to predict the participation rate and the resulting vehicle volumes, but we are preparing for a 1% participation from Broome County residents equalling 750 vehicles going through the collection site. Considering the fact that the event will last for 6 hours, we will be prepared to unload 100-125 cars per hour (unfortunately many of these vehicles may arrive in the morning). It is our intent to unload the vehicles in blocks of six when volume permits. When and if vehicle flow is slow we will be able to unload vehicles on an individual basis. See Traffic Flow Diagram attached.

II. Clerical/Data Collection

We have designed two forms to be used during the event day.

• Generator Survey

The first is called the Generator Survey (see attached). This form is two sided and is to be completed by the participating resident. A Generator Survey will be giving to each resident/vehicle as they arrive onto Old Mill Road (Zone A). They will complete this survey during their waiting period prior to be unloaded in the transit garage (Zone C) and hand the completed form to the unloading volunteer. This survey will then be stapled to the yet to be completed Receiving Manifest.

• **Receiving Manifest**

This second form is called the Receiving Manifest (see attached). This form is one sided and will be completed only by the unloading volunteers. All recording onto the Receiving Manifest will be done in the transit garage (Zone C). When completed the Receiving Manifest and the attached Generator Survey will be placed into the designated form box at each unloading station (C1-C4).

Any questions on form completion or recording of data will be covered by NRRA staff.

III. **Volunteers**

We will need a total of 20 volunteers on duty at all times. The breakdown is as follows:

Zone 1 - Distribution of Generator Surveys	2-4 Volunteers
Zone B - Direct Traffic into Transit Garage	2 Volunteers
Zone C - Unload Vehicles	12 Volunteers
Zone C - Collect and Coordinate Paperwork	2 Volunteers
Zone C - Direct Traffic and Material Movement	2 Volunteers

A volunteer orientation meeting will be held at 8:00 a.m. the day of the event, November 9. At this meeting Volunteer Packets will be distributed explaining the vehicle flow, the paperwork system and other event details.

IV. **Refreshments**

NRRA will provide coffee and donuts for all volunteers throughout the day. A pizza lunch and sodas will also be provided for all volunteers.

V. Equipment & Supplies

There are numerous equipment and supply needs for this collection day. In order to make the equipment and supply coordination as simple as possible we have created the following list;

<u>Equipment</u>	<u>Quantity</u>	<u>By When</u>	<u>By Whom</u>	<u>Location</u>
•Forklift	1	11/9	Envirocycle	Zone D
•Pallet Jacks	2	11/9	Envirocycle	Zone C
•Pallets	125	11/9	Envirocycle	Zone D
•Gaylord Boxes	100	11/9	Envirocycle	Zone D
•Folding Tables	6	11/9	Broome County	Zone C
•Folding Chairs	10	11/9	Broome County	Zone C
•Paperwork Bins	6	11/9	Broome County	Zone C
•Directional Signs	4	11/9	NRRA	Zone A
•Clip Boards	24	11/9	NRRA	Zone C
•Staplers	6	11/9	NRRA	Zone C
•Pencils	100	11/9	NRRA	Zone C
•Pens	24	11/9	NRRA	Zone C
•Markers	12	11/9	NRRA	Zone C
•Misc. Supplies		11/9	NRRA	Zone C
•Gen. Surveys	1200	11/9	NRRA	Zone C
•Rec. Manifests	1200	11/9	NRRA	Zone C
•Name Tags	50	11/9	NRRA	Zone C
•Coffee Urn	2	11/9	NRRA	Zone C
•Coffee	5 lbs	11/9	NRRA	Zone C
•Sugar...etc		11/9	NRRA	Zone C
•Donuts	4 doz.	11/9	NRRA	Zone C
•Pizza	8	11/9	NRRA	Zone C
•Sodas	2 cases	11/9	NRRA	Zone C
•Coolers	2	11/9	Broome County	Zone C
•Ice	6 bags	11/9	NRRA	Zone C
•Safety Vests			Broome County	
•Gloves and Aprons			Broome County	
•Stop Signs			Broome County	
•Traffic Cones & Flags			Broome County	
•Ext. Cords			Broome County	
•2-way Radios			Broome County	
•Receipts			Broome County	
•Name Tags			NRRA	

VII. Envirocycle

Envirocycle will provide (1) 53' trailer and (1) small box van truck with a lift gate. They will also provide gaylord box labels for each gaylord used in the collection day.

Envirocycle will bring the gaylords, the pallets, the forklift and the pallets jacks with them when they arrive at 7:00 a.m. 11/9.

Residential Electronics Collection Pilot

Broome County Volunteer Packet

Welcome and thank you for volunteering your time today. The electronics collection event we are about to begin is an exciting opportunity to learn more about how electronics are used, stored and disposed of in the Broome County. We hope that through our efforts today we can produce reliable data for use by many other communities throughout the country who are interested in establishing their own electronics recovery programs.

The key word for today for all of us is **data**. We are depending on each of you to make sure that every form, every car count and every participant is accounted for. To make this process as easy as possible we have put together a "zone" system for all of us to follow. Please try and adhere to this zone system if possible and if you have any questions - please ask.

Zone A

This area will be staffed by three volunteers. This is the area to distribute the generator surveys (blue forms), clipboards and pencils. This is also the zone where we greet the participants in a friendly manner and answer any early questions they may have. This is also the zone where one volunteer will collect the vehicle fees.

Zone B

This area will be staffed by one person. This volunteer will be responsible for counting every car entering the unloading circle and for directing vehicles into the proper traffic lanes. All vehicle counts will be recorded on a hourly vehicle log.

Zone C

This area will be staffed by a minimum of 8 volunteers. The volunteers working this area will have to; receive the completed generator survey forms and staple them to the receiving manifest, complete the receiving manifest and, unload the participants' electronics into the properly marked gaylords. Once the participants vehicle is completely unloaded they can be sent through the exit lane.

Zone D

Only 1 volunteer needed in this area. This volunteer will oversee traffic exiting.

* We will also position 1-3 volunteers on Old Mill Road for traffic coordination

VOLUNTEERS

ZONE A: 2 volunteers
Distribution of Generator Surveys

ZONE B: 2 volunteers
Direct Traffic into Transit Garage

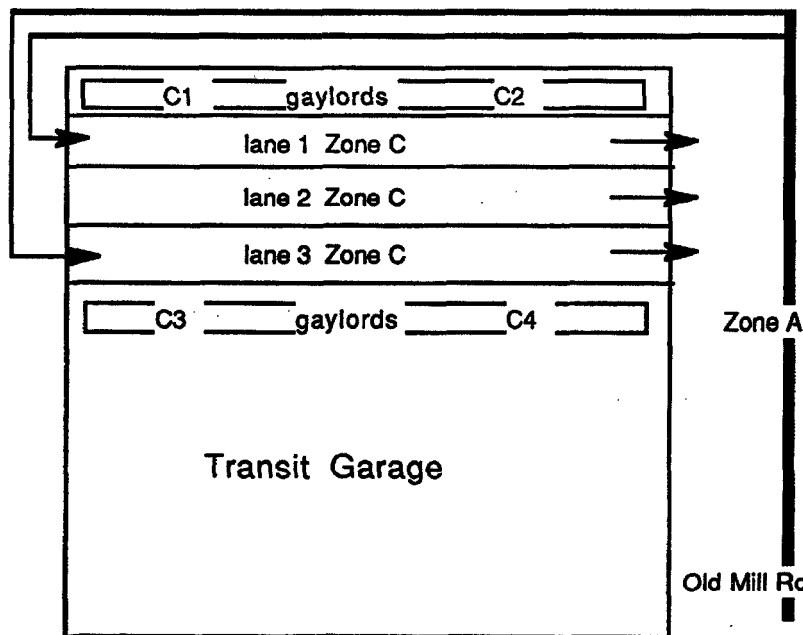
ZONE C: 8 volunteers
Unload Vehicles

ZONE C: 2 volunteers
Collect and Coordinate Paperwork

ZONE D: 2 volunteers
Direct Traffic and Material Movement

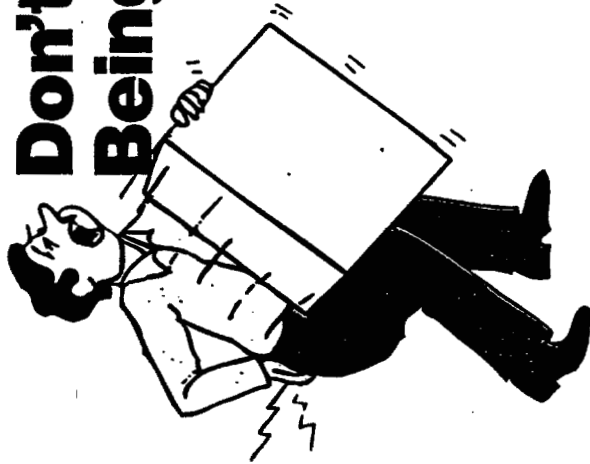
Zone D

Zone B



Old Mill Road

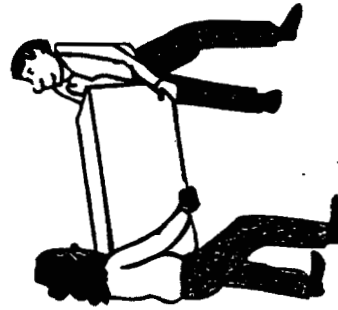
Don't Get Hurt Being a Hero



If a load is too
big or heavy to
carry without
strain,
**get
help!**

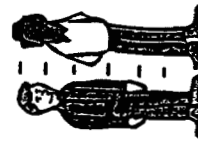


**Use a cart, dolly,
forklift, wheelbarrow,
or other carrier. Or
get another person to
share the load.**

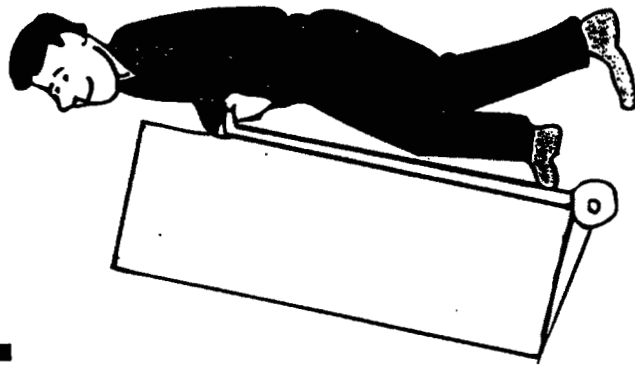


A two-person lift works best if

- both people are about the same height.
- one person is in charge of saying when to move where.
- you lift and raise at the same time.
- you keep the load at the same level while carrying it.
- you move smoothly together.
- you unload at the same time.



Special Equipment Can Help



When using a hand truck, dolly, or other material handling equipment, follow these tips:

- Push, don't pull—you'll get twice the power.
- Keep the load close to your body.
- Have a firm grip.
- Keep your back straight, knees bent, and lean in the direction of movement.
- Let your legs and body weight do the work.

A few more hints for safe lifting

- Warm up before you lift—it's an athletic task! Bend or stretch gently to get ready.
- Try to break a large load into several smaller ones.
- Wear safety shoes with reinforced toes and nonskid soles.
- Wear tight-fitting gloves to protect your hands and get a better grip.
- Avoid loose clothing that could get in your way.
- Try to load and unload at waist height.



Most important, don't overdo it. The risk of injury is too great. Know your own limitations and get help if you need it.

If you do hurt your back: Don't move

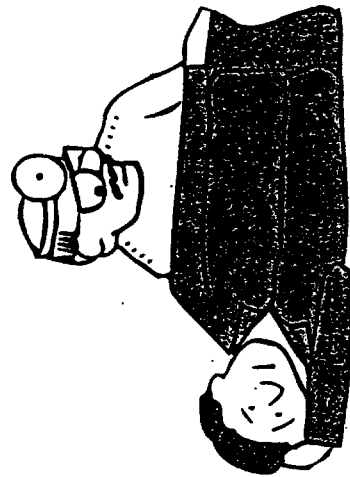


Rest until medical help arrives.

Back problems can be very serious, and any more moves can make them worse.



Get medical attention immediately, and follow instructions to the letter.



Learn how to lift safely



You'll avoid injury and help protect your back—which helps you stand, sit, and move.

- ☒ Watch your weight; eat moderately and diet sensibly.
- ☒ Bend your knees—not your back.
- ☒ Exercise to strengthen muscles and improve flexibility.
- ☒ Plan each lift before you start.
- ☒ Let your legs, not your back, power your lifting.
- ☒ Lift smoothly—don't twist while lifting.
- ☒ Don't overdo it. Get help with loads that are too heavy or awkward for you to move comfortably.

Appendix 9

Organizing a Household Electronics Collection

ORGANIZING A HOUSEHOLD ELECTRONICS COLLECTION

Decide who will host the collection program.

Will the unit of county or local government host the collection at a licensed solid waste/recycling facility? Drop-off facilities typically already have met required state and local regulatory requirements and are licensed. Many possess some of the equipment, supplies and storage facilities you will need, and have trained personnel experienced in dealing with the public. Those municipal or county receiving and processing facilities not generally open to the public may have experience with one-day collections of hazardous waste, textiles or bulky wastes.

A large manufacturing facility may also make a good host site. Typically, it would have the needed permits, moving and lifting equipment, trained staff, adequate receiving and storage space and provisions for hazardous waste storage. A major advantage of linking residential electronics collection to a manufacturing site host facility is that the manufacturer may already have transportation and marketing arrangements in place, eliminating the need for market surveys, site visits, request for proposals and contract negotiations with the manufacturer. The disadvantage is that, since residents are not habituated to taking trash and/or recyclables to that site, collection event planners will need to mount a much more ambitious education and promotion campaign to ensure high public participation at the new site.

A much less desirable host site option is the parking lot/loading dock area of a large wholesaler or retailer of electronic equipment. Hosting an EOL electronics collection event could be good publicity for the business. This is the riskiest option because the hosts will have had no experience collecting waste or recyclables and will not be aware of the high level of detail required to ensure a smooth collection and protect both workers and the participating public. The hosts will need education about sorting protocols when "wastes" are being accepted for reuse or recycling, as well as the potential for receiving unacceptable hazardous wastes.

Decide who can participate in the collection program.

Will you limit participation to city/county residents only?

Are there colleges in your jurisdiction? Since many colleges already operate well-established recycling programs, local planners could coordinate the special electronic collection with the academic communities' recycling program managers or facilities managers. Municipalities might also approach college environmental studies departments about developing a citywide electronics collection as a special student project.

Will you invite small business participation? The quality and volume of materials collected will rise considerably if businesses participate; however, involving businesses also increases the risk that non-specified hazardous materials will appear in your collection.

Survey Potential Markets

It is very important to survey your prospective markets, issue requests for proposals if necessary and select a market before doing any further planning for your collection program. *The manufacturer you finally select to receive and dismantle the electronic appliances your program collects ultimately will determine the collection specifications, economics and many of the logistical arrangements of your program.*

Create a list of prospective markets by calling or visiting your state or county environmental regulatory agency, state recycling coordinator's office or your state nonprofit recycling association. Also check with facilities managers or recycling managers of any large companies in your area; they may already be recycling electronic equipment and able to refer you to manufacturers that could serve your collection program.

Do some advance checking on prospective markets. Check state or county regulatory agencies to see if the manufacturer is properly permitted and/or licensed; ask whether the company has been cited for environmental or other violations. Call the companies directly; ask how long they have been in business, and whether they've ever participated in a residential EOL electronics collection program. Ask for three references from previous or current customers and check these references.

If you've developed a long list of prospects, you may want to issue a request for proposals (RFP) to help you find the best market. Keep your RFP simple:

1. Describe what you intend to do and what you will require of the service provider you select.
2. Ask for a detailed list of post-consumer electronics the company will accept for demanufacturing, what the economic terms will be, whether or not they can provide transportation, gaylord storage boxes and other supplies.
3. Ask for specific information about how the company disposes of residual (non-reusable, non-recyclable) materials. Include questions about contingency planning for receiving (non-specified) hazardous wastes.
4. Will they provide labor during the collection event(s)?
5. Have they participated in household collection events? What will they expect of the host site?
6. Keep the RFP open-ended enough for prospective responders to offer their own innovative features you may not have considered.
7. Ask for information about the company itself: history, profiles of chief operating officers, financial reports and credit references.
8. Set a reasonable deadline for responding (two weeks). Describe how the selection process will work and reserve the right to reject any or all proposals.

In the unlikely event you receive more than four responses, have a committee review the responses and select two or three for your short list.

Vendor Audits

In the current regulatory requirements involving long-term liability, and strict, joint, and several liability, it is imperative that any community or organization planning an electronics collection event ensure that any vendors will be responsible for the materials collected. This is achieved by performing an environmental vendor audit that includes several steps. Once the "short list" has been prepared, then the vendors should be informed that a vendor audit step is the next necessary function. The vendor audit includes three major components:

a. **Environmental File Review:** A list of potential vendors should be forwarded to the state environmental services department and the US Environmental Protection Agency Region office, together with a cover letter indicating that your community/agency is considering using the services of the vendors listed in your letter, and requesting to review the environmental files for all the companies. Most environmental services departments can schedule this File Review in less than three weeks from the date of the request.

The File Review process allows a complete review of the environmental files maintained by that department on each vendor. Each vendor's files should be carefully reviewed, and photo copies made of appropriate documents to document that vendor's compliance or lack of compliance.

b. **Regulatory Compliance:** Beyond the environmental file review is a general review of the environmental compliance of each potential vendor. Vendors should be easily able to answer questions and provide copies of plans or documents in the following areas:

(1.) **OSHA:** provide a complete list of any state and Federal OSHA citations, visits, reports and communication within the last four years.

(2.) **Department of Labor:** provide a complete set of documents concerning any issues with the Department of Labor, accident reports, etc. for the last four years.

(3.) **Environmental site compliance:** Have each vendor provide a copy of the following environmental plans for any site that could receive your materials:

National Pollution Discharge Elimination System permit to discharge
Stormwater Pollution Prevention Plan
Spill Prevention, Containment, and Control Plan.

(4.) Health compliance: Have each vendor provide a copy of the following health plans for any site that could receive your materials:

Hazard Communication Plan
Job Hazard Analysis

(5.) Safety compliance: Have each vendor provide a copy of the following safety compliance plans/statements for any site that could receive your materials:

Corporate Safety Policy Statement
Employee Checklist for Environmental, Health and Safety training
Emergency Action Plan
Confined Space Entry Plan (if applicable)
Forklift Training Plan
Lock out/Tag out Plan (if applicable)

Site visit: A site visit is a critical component of the assurance needed by a community or agency to ensure that a vendor is qualified to perform services. The site visit is scheduled with the vendor, and one or two representatives of the community travel to the facility to perform the site visit component of the vendor audit. Several components of the site visit include:

(1.) Arrival at the facility: drive by the site, and observe the general neighborhood as well as the actual facility being visited. Observe operations at the site, and record any potential adjacent businesses that could have an environmental impact on the facility.

(2.) Site tour: Have an employee of the company escort the group to all areas of the facility. Observe any potential environmental, health and safety concerns as well as critical operations.

(3.) Documentation: Any documentation not previously submitted should be delivered to the site visit group during this site visit.

(4.) Exit interview: Review the standards and procedures necessary for the vendor to qualify to perform services to your community or agency. If not all concerns or documents are received by this time, set a firm date to have all issues resolved and submitted.

Develop a Detailed Working Agreement

Once you have selected a demanufacturer, negotiate the specific details of your collection event(s).

1. First, agree upon detailed specifications for all materials you will collect. If you plan to set aside reusable for resale or donation, who will determine the reusability of the materials as they come in? Who receives the revenue? Who pays the expenses?

2. Agree at which point the demanufacturer takes ownership of the materials.

3. Decide on the date(s) and hours of your collection event(s), including alternate dates for bad weather.

4. Agree upon the specific *responsibilities* of each party. Then assign one overall manager to keep the parties on track fulfilling their obligations:

a. how many workers will be required to staff the event?

b. who will be responsible for recruiting paid and volunteer staff for the collection event?

c. who will train the workers? how? when?

d. after making a detailed list of all supplies and equipment you will need, assign responsibility for each item on the list

e. Who will be responsible for the various forms of insurance your event may require? The collection events do involve some risks to workers. Unloading and loading involve some heavy lifting, the possibility of contact with broken glass or cut wires and the possibility of being hit by a moving vehicle. Trucks, forklifts and loaders will operate at the collection facility, posing a hazard to volunteers not accustomed to working around heavy equipment. If collection site is not a government property such as a public works garage or solid waste receiving facility, planners may want to check into event-day liability insurance. Event planners might find it prudent to draw up a waiver for volunteers to sign.

f. Who will transport the collected electronics from the host site to the demanufacturing site? If you plan to hire a third-party trucking operation, who will contract with the trucker? Require the trucking contractor (whether a separate contractor or the demanufacturer) to show proof of adequate insurance coverage, naming the event organizer(s) as "additional and named insured."

g. How will the collection site be set up? How will traffic flow?

h. Who will handle public education and promotion of your event? Even if you will assume final responsibility, your buyer may have connections and many good ideas on how to promote the collection, as well as boiler-plate brochures, press releases you can tailor for your own use. (See below for a detailed plan for putting out a mass mailing.)

5. Develop contingency plans for handling hazardous waste that may enter your collection stream. Even with the best ongoing programs of public education, municipal solid waste managers everywhere deal with the regular appearance of household hazardous wastes - and even occasional hazardous waste from local business generators - at drop-off collection facilities, whether they have periodic HHW collections or not. These realities create special considerations for electronics collection events. No matter how thorough your program of public education, how well advertised the specifications for collection, electronics collection planners must develop a plan for dealing with hazardous waste that may show up during the collection event.

Set up a plan for monitoring incoming materials for hazardous waste and turning away those materials before they have been unloaded from a participant's vehicle. In most cases, the host site legally owns materials, including hazardous wastes that may be present, as soon as they are unloaded from the participant's vehicle. If the host site does not already incorporate a hazardous waste receiving/collection facility, you may want to make contingency plans for dealing with any hazardous materials you may receive.

6. Agree on all financial aspects of the project: Will you pay the demanufacturer a flat fee? Will you add up expenses and revenues and pay vendor the difference? Will the vendor offer a financial incentive for high volume or high quality of materials?

7. Make a list of all federal, state and local regulations that may apply to your collection event. Agree on how you will assure compliance with all of them.

Commit all these decisions to writing, striving for simplicity and clarity. Pass the document back and forth between you and your selected vendor until you can agree on all the language. Then have a lawyer review the agreement. If you spend time negotiating and working through every detail of your agreement, you will avoid misunderstandings that can lead to legal problems. Follow the terms of your own obligations to the letter.

Mass mailings

Decide on the most appropriate method for contacting your constituents based on locally available mailing lists, journals, newspapers, etc.

For event organizers who may not have had experience handling large direct mailings, here are the six steps to take to ensure that residents (and small businesses, in cases where they will be invited to participate) will receive flyers two to three weeks prior to the collection date. Many of the steps are not sequential, but involve simultaneous coordination among subcontractors to ensure mailings go out on time.

1. Begin planning large mailings at least 12 weeks before the collection event. The reason for the long lead time is that you may need to coordinate the activities of several subcontractors: printers, list broker and mail

house. All of these types of businesses have busy seasons and busy times each month. You need to schedule your activity weeks in advance to give your mailing top priority.

2. Assign someone to be accountable for all details of the mailing. This is critical if you want your mailing to reach residents on time. Missing a scheduled date with the printer or the mail house can put your job a week or more behind schedule - if you miss your print deadline, you'll probably miss your date with the mail house, too. Your flyer won't be useful if people don't get it in time to plan to attend your event! Assign someone to keep track of deadlines.

3. Develop the flyer. About eight weeks before the collection event, develop the flyer, or hire a subcontractor to develop the flyer, using desktop publishing software. Your flyer should include: the location, date and hours of the collection event(s); a brief description of the program; a detailed list of acceptable materials to bring the designated drop-off location or leave at curbside; a telephone number to request further information; the dates for any follow-up collection events.

4. Order any mailing lists you don't already have through a *print mail broker*. Listed in the Yellow Pages under "Mailing Lists", "Mailing Services", "Advertising/Direct Mail", mail brokers maintain continuously updated "occupant file" lists of residential households and Standard Industrial Classification (SIC) business lists for each community as well. Get the mail broker to provide you with an accurate count of the number of households and businesses to receive the mailing, so you can contact the printer early to schedule your job. We called the mail broker eight weeks before the scheduled collection date to order our list(s). Schedule delivery of the lists you order from the broker *in the forms specified by your mail house (or the form you prefer, if you are doing your own mailing)*. We specified that the lists should arrive at the mail house one week before the date we had scheduled with our mail house (see below) to send out our flyers.

5. Contact a local direct mail house to handle the bulk mailing. Most list brokers do not handle bulk mailings themselves. They rely on the services of a direct mail house to label, sort and mail your flyers. As soon as you know how many flyers you need for your mailing, schedule your mailing with the mail house; schedule it to go out two or three days before you want your flyers in the hands of residents/businesses. If the list broker is going to deliver the mailing list(s) directly to the mail house, the person responsible for managing the mailing should make sure to schedule delivery by the broker two or three days prior to the date scheduled with the mail house to run your job.

6. Contact the printer. As soon as you have an accurate count of the numbers of residences and businesses on your lists, call the printer to schedule your job. While the printer may be able to complete your print run quickly after you deliver the mock-up (on disk or in hard copy), the company is unlikely to fit your large job into a busy schedule. Schedule large mailing several weeks in advance of the mailing date to ensure that your mailing goes out on time.

NOTE ON TRANSLATION ISSUES *Jurisdictions with significant non-English speaking constituencies may want to consider offering the flyers in multi-lingual versions, or at least including directions for where non-English speaking recipients can call for more information.*

Aftermath

Plan to conduct an informal review of your electronics collection event while it is still fresh in everyone's mind. Put someone in charge of keeping the session on track, and appoint someone to take notes. Discuss what worked well and where the glitches were. Brainstorm ways the event might have been improved.

Thank all volunteers, participants and any event "sponsors" publicly and personally recognize leaders and people who worked especially hard. If the collection was successful, make a big deal of it through signs posted at the local recycling facility, press releases, radio announcements, editorials or letters to the editor.